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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 9 MAY, 1929 NUMBER 5

STENOSIS OF THE LARYNX

A NEW METHOD OF SURGICAL TREATMENT *

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Last year I was invited to give a lecture before the Inter-State Post Graduate Medical Assembly of North America at its meeting in Kansas City, and I chose to speak about a new method of surgical treatment of stenosis of the larynx, which I had been using since 1910, and which had given me excellent results. My paper was published in the *Proceedings of the Inter-State Post Graduate Medical Assembly of North America*, which has a limited circulation. I have been asked, therefore, to prepare a restatement of this work for publication in the ARCHIVES OF OTOLARYNGOLOGY, in which it will reach a large number of men who are interested in this sort of work.

Fifty years ago every case of chronic stenosis of the larynx had to be considered incurable. Modern laryngologists may claim that every patient with chronic stenosis due to cicatrization of the soft parts, syphilitic perichondritis, ulceration, postoperative lesions, diaphragmatic formation, synechia and similar pathologic processes can be cured, and when I say cured I mean that by correct treatment so large a passage through the larynx and the trachea can be produced that the patient can do without a tracheal cannula, and breathe naturally through the mouth.

REVIEW OF EARLIER METHODS

About 1870, Ludwig von Schroetter began his well known method of dilation by means of tin bolts and hard india rubber tubes and thereby inaugurated his famous and effective treatment of chronic stenosis of the larynx and trachea. The results obtained caused a great and well deserved sensation at a time when every patient with chronic laryngeal stenosis was considered incurable; but the results were far from ideal, and the treatment demanded great patience from the surgeon, as well as from the patient. The treatment, which was often painful and disagreeable, had to be continued for months and years, and the consequence was often that the patient gave it up before a definite cure had been obtained.

* Submitted for publication, Jan. 16, 1929.

In 1885, O'Dwyer [1] published an account of his famous method of intubation, and already, in his first paper, he recommended intubation in cases of chronic stenosis of the larynx. At the following international congress in Washington he reported, in all, five cases of this kind in which he had treated the patients successfully by intubation.

At the congress in Berlin, 1890, Lefferts,[2] of New York, demonstrated his excellent instruments of intubation in cases of stenosis of the larynx in adults. Four years later, at the international medical congress in Rome, I could, in my report on laryngeal intubation in adults, declare that to my knowledge the intubation instruments of Lefferts were the only instruments to be used. In the meantime, it was evident that intubation tubes could be introduced only if there was a passage through the larynx. In complete atresia of the larynx, one had first of all to split the stenosis by laryngofissure or tracheofissure and afterward use intubation to prevent recurrence of the stenosis.

The results gained under these circumstances were not, however, satisfactory, and in severe cases of stenosis it was impossible to obtain a perfect cure—that is, one getting rid of the tube.

Better results were reached by means of the metal bolts described by Thost [3] and with Brüggemann's modifications of Thost's method. Uckermann's method has also given satisfactory results.

In the course of years, I have used Schroetter's hard india rubber tubes, O'Dwyer's intubation tubes, Mikhulicz's glass tubes and many other methods of dilation, but none of them has been quite satisfactory, even though I have had many fairly good results.

There are certain patients in whom laryngeal and tracheal stenosis is refractory to these treatments; although continued for years, the treatments do not cure the patient. These are such patients as suffer from extensive fibrous synechiae of the walls of the larynx or the trachea.

It is only since I began to use an entirely new method of treatment in these patients (beginning in 1910), that I have obtained really good results, even in the most serious forms of stenosis, and the method has, in my hands, and as it is now employed, proved efficacious with patients of all ages, even small children, without risk to the patient's life.

In this respect, my method is better than laryngotomy, as proposed by French colleagues, among whom Sargnon and Balatier are the leaders. Laryngotomy certainly makes it possible to restore the lumen of the larynx, even in the most severe cases of stenosis; but, on the other hand, this treatment can be employed only within certain limits and is also more dangerous for the patient. According to Laurens,[4]

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1. O'Dwyer: New York M. J., Aug. 8, 1885.
2. Lefferts, George: New York M. Rec., Oct. 4, 1890.
3. Thost: Die Verengerungen der oberen Luftwege nach dem Luftzöhrenschmitt, Wiesbaden, 1911.
4. Laurens, George: Chirurgie de l'oreille, du nez, du pharynx et du larynx, ed. 2, Paris, 1924, p. 945.

laryngotomy on children is attended by great mortality; of twenty-five children operated on fourteen died—more than half—and adults are exposed to the same danger as long as the wound caused by the laryngotomy is the seat of a gangrenous process which may cause infection of the lungs.

NECESSITY OF CAREFUL PRELIMINARY EXAMINATION

Before I go on to describe my own method, I wish to make it clear that in every case of chronic laryngeal stenosis the patient must first of all undergo a careful examination; the larynx and trachea have to be examined directly and indirectly with the utmost care in order to decide the degree, the shape and the nature of the stenosis. In children, this examination must be made under deep narcosis.

In many cases, one finds the reason for the difficult removal of a cannula to be simply that the tracheal cannula has been placed too high up and too near the larynx, and that it has caused a perichondritic reaction, i.e., thickening of the cricoid cartilage. In this case, it is best to begin with a deep tracheotomy, in which the cannula is moved as far from the larynx as possible, and then wait for two months. In this manner, I have cured a number of patients with tracheal and laryngeal stenosis; the gradual thickening of the wall which caused the stenosis disappeared, and the patients could, after a few months had elapsed, dispense with the cannulas without further operation.

I have treated patients in whom an attending physician had had to make an emergency tracheotomy, as the patient was dying of suffocation and there was no time in which to perform a careful or correct operation. It is in such cases that a tracheotomy easily becomes a cricotomy or a cricothyroidotomy. In one case, the cannula had been introduced through the thyroid cartilage. In such circumstances, it is not sufficient to move the cannula down under the thyroid gland, because the cannula (which has often lain for months, sometimes half a year, in the larynx) may have caused such serious perichondritis and ulcerations that a fibrous diaphragmatic web develops as soon as the tube is removed.

The less serious degrees of stenosis which are caused by a position of the cannula close to the cricoid, are best treated by using O'Dwyer's intubation tubes; these are introduced daily, they are left in position for about half an hour and then the tracheal cannula is replaced.

A short time ago at a meeting of the Danish Otolaryngological Society, I presented a little boy who suffered from stenosis of the larynx caused by a cricoid perichondritis, which originated from a foreign body that he had in his larynx for six months. This case is such an excellent example of the diagnostic and therapeutic difficulties that a general practitioner may come across in cases of stenosis of the larynx that I will describe it more carefully.

A boy, aged 2½ years, was brought to a hospital in a provincial town, suffering from a sudden attack of suffocation. Tracheotomy was instantly performed. The diagnosis was croup, but no diphtheria bacilli could be found. As the cannula could not be removed, he was sent to the university clinic in Copenhagen. I examined him under deep narcosis by means of suspension laryngoscopy, and found the upper part of the larynx natural; but further down, the larynx was closed by a hard metallic body which was so firmly embedded that it could not be removed.

The roentgen examination revealed a large foreign body of peculiar shape in the larynx (fig. 1). A few days later, therefore, I performed the inferior tracheotomy, since the cannula was placed too high up in touch with the cricoid. I thereupon made a laryngofissure and found the foreign body—a tin soldier—which was easily removed.

After this, the patient was comparatively well, but as there still was a prominent stenosis six weeks after the operation I began a treatment with

Fig. 1.—The x-ray picture shows a tin soldier above the cannula.

O'Dwyer's tubes. After two months' treatment, cure was effected, the cannula was removed, and the patient was sent home with natural respiration and a strong but slightly hoarse voice.

In cases of stenosis in which the removal of the cannula to another position alone or in connection with O'Dwyer's intubation does not give a successful cure, I employ my own method, heretofore mentioned, of the translaryngeally fixed tube, which I have employed since 1910.

METHOD FOR MORE SERIOUS CASES OF STENOSIS

In children, the operation is performed with the patient under deep sleep from ether or chloroform; in adults it may be done with the patient under local anesthesia. First of all, the tracheal cannula is removed as far from the larynx as possible by means of inferior tracheotomy. From there, the stenosis is split from the outside by a

laryngotracheal fissure. The stenosis is thereby exposed—freely—and its form, character and extension are carefully examined.

If one has to do with diaphragmatic strictures, these are instrumentally removed, as far as possible, by means of scissors, knives and punch-forceps, and the lumen of the stenosis is made as nearly normal as one can make it, so that the biggest possible drain can be introduced into the narrowed part of the larynx.

It is best to use an india rubber drain slightly wider than the lumen, so that the drain may cause a certain pressure against the walls of the larynx.

The laryngeal drain, which is about 5 cm. long, must be placed so that it extends outside the narrowed part of the windpipe.

The lips of the wound are kept apart by means of retractors, and it is thus made easy to introduce the drain through the fissure. The upper end of the drain must not protrude into the superior aditus of the larynx, because, in this case, particles of food can get into the trachea and cause irritation, coughing and, eventually, infection of the air passages.

After the tube is in place, the position of its upper end must be determined either by introducing the exploring finger through the mouth or by means of suspension laryngoscopy. If the upper end protrudes into the pharynx, one must correct the position of the drain and fix it in a lower position.

Fixation of the drain is performed translaryngeally by means of a long, curved perineal needle, which is passed from side to side through the soft parts of the neck, the thyroid cartilage, the mucus membrane and the drain; and by means of the needle, a silver wire of medium thickness is drawn back through the throat.

In this manner, the drain can be firmly fixed in the stenosis and will do its work of dilation for months without inconvenience to the patient.

The ends of the wire are cut off as close to the skin as possible.

The external wound can either be closed with a few stitches, or left to itself—it heals in the course of a few days.

Figures 2 to 11 show how the india rubber tube is placed in the larynx.

In children, the tracheal cannula is left in position; even if introduction of the drain gives good results with regard to respiration. It often happens in cases of children with small lumina of the larynx that the tube is obstructed, thereby causing suffocation; in that case, the tracheal cannula has to be reintroduced at once. Such dangerous attacks can, as stated, be prevented by letting the cannula remain in the trachea.

In adults, on the contrary, in whom one can often from the very beginning introduce tubes the size of a finger, one may, in many cases, be able to remove the tracheal cannula directly after having introduced the drain, as the lumen of the latter will be sufficient to permit perfectly easy respiration.

Figure 2

Figure 3

Fig. 2.—Figures 2 to 11 show how the india rubber tube is placed in the larynx. This x-ray picture shows the india rubber tube above the cannula, frontal view.

Fig. 3.—The x-ray picture shows the india rubber tube above the cannula, side view.

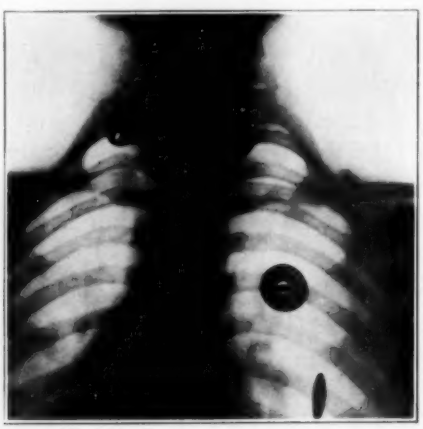

Fig. 4.—The x-ray picture shows the india rubber tube fixed by silver wire above the cannula.

The drain, having been allowed to remain in position for a sufficient time, can—together with the wire—after weeks or months be removed from above by means of a forceps introduced under direct or indirect laryngoscopy (fig. 12). This is performed in children under general

Figure 5

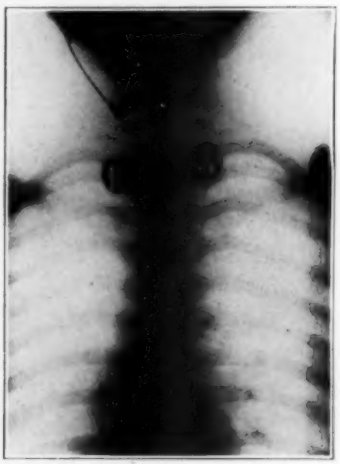

Figure 6

Fig. 5.—A side view of the india rubber tube and the cannula.
Fig. 6.—A frontal view of the india rubber tube and the cannula.

Figure 7

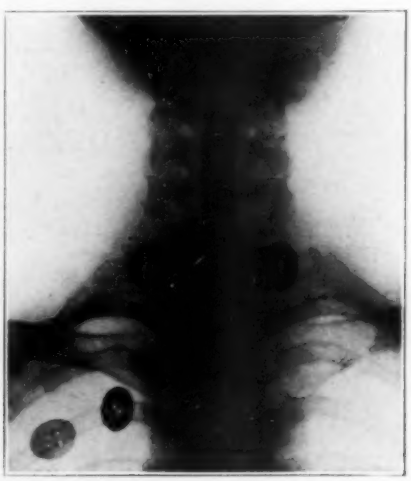

Figure 8

Fig. 7.—A side view of the india rubber tube and the cannula.
Fig. 8.—A frontal view of the india rubber tube and the cannula.

Fig. 9.—A side view of the india rubber tube and the cannula.

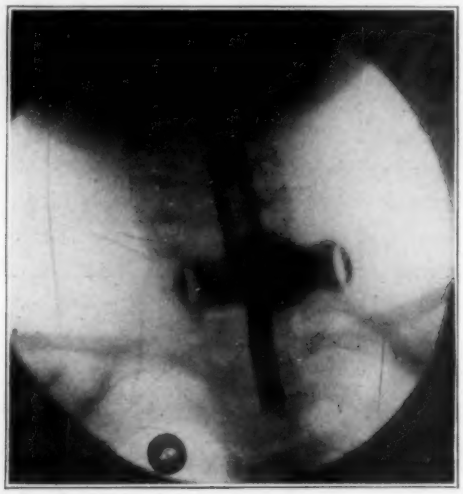

Fig. 10.—A frontal view of the india rubber tube and the cannula.

Fig. 11.—A side view of the india rubber tube and the cannula.

Fig. 12.—A patient with a healed tracheal fistula, carrying in her laryngeal stenosis an india rubber tube translaryngeally fixed by silver wire.

Fig. 13.—In this patient, both ends of the wire were secured with pieces of wood.

anesthesia; in adults, under local anesthesia of the pharynx and upper part of the larynx.

Even in cases in which a drain has been in position for as long as three months, I have always found it entirely free from any sort of incrustations, and the larynx as well as the stenotic parts of natural appearance and without reaction.

At first, I feared that the wire would loosen and by degrees slip out to one or the other side of the neck. For this reason, I made the wire so long that it protruded considerably on each side, and I furthermore secured it on both sides with pieces of wood and metal (fig. 13).

This, however, was disagreeable for the patient, who had to wear bandages to protect the wire from being broken—and the patient was also liable to infection.

I eventually gave up this treatment and cut off the wire as closely as possible, at the same time pressing down the skin with the scissors, so that it could slip back into its old position and cover the ends of the wire (fig. 12). I have never observed any inconvenience from this manner of fixation, and the drain has remained in position for months without removing.

REPORT OF CASES

In all, I have treated eighteen cases of stenosis of the larynx in this manner and all with excellent results.

These eighteen patients might be grouped according to age, as follows: 1 to 3, three patients; 4 to 6, six patients; 10 to 14, three patients; 18, one man; 24, two women; 32, one man; 36, one woman; 56, one woman.

The nature of the stenosis was different in every case.

In seven cases fibrous diaphragms were formed, which varied greatly as to both extension and position.

CASE 1.—The first patient on whom I operated was a man, aged 32, with a diaphragmatic agglutination of the false vocal cords (fig. 14) caused by an attempt to commit suicide with a razor six months earlier. He had cut through the thyroid cartilage. He was sent to a general surgical ward, where a tracheotomy was done on account of difficulties in respiration. As the cannula could not be removed, the surgeon twice performed laryngofissure and removed the cicatricial adhesions, whereupon the wound was closed. As a result, the passage became narrower and narrower every time, and the false vocal cords had almost grown together. There was only a small opening at the back (fig. 14).

I performed laryngofissure, removed the cicatricial tissue and introduced drain no. 39, which was translaryngeally fixed with silver wire. The drain was left in position, first for five weeks, and later for four weeks. The passage was then assured, and the patient has been well ever since.

CASE 14.—A child, aged 3, had complete diaphragmatic occlusion at the level of the cricoid (fig. 15) caused by a tracheotomy after croup.

Figure 14

Figure 15

Fig. 14.—A diaphragmatic agglutination of the false vocal chords caused by an attempt to commit suicide with a razor six months earlier. Following tracheotomy and laryngofissure, the false vocal chords had almost grown together, only a small opening being left at the back.

Fig. 15.—Complete diaphragmatic occlusion at the level of the cricoid caused by a tracheotomy after croup.

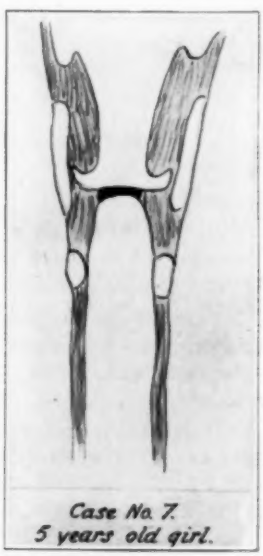

Figure 16

Figure 17

Fig. 16.—A thick, fibrous diaphragm immediately over the tracheal fistula with only a narrow opening at the back.

Fig. 17.—A partial synechia of the vocal chords caused by operative treatment for multiple papilloma three years before.

Case 7.—A girl, aged 5, was tracheotomized three and a half years earlier for croup. I found a thick, fibrous diaphragm immediately over the tracheal fistula, with only a small narrow opening at the back (fig. 16).

Case 10.—A girl, aged 6 years, had a partial synechia of the vocal cords, caused by operative treatment for multiple papilloma three years before (fig. 17).

Case 12.—A boy, aged 14, at the age of 3 years had been treated by me for a diaphragmatic formation on the level of the cricoid, and had left the hospital without the tracheal cannula and with a clear sounding voice. At the age of 14, he appeared to have a circular stenosis on a level with the cricoid, which caused respiratory difficulties if he tried to run or had a cold. The stenosis was split open and a drain introduced, and in two months he was cured.

Case 13.—A girl, aged 4, had a congenital circular tracheal stenosis situated 1 cm. under the vocal cords. Four months before she came to me, tracheotomy had been performed to prevent suffocation. The position of the cannula was high. On account of this, inferior tracheotomy was first performed. Thereupon

Fig. 18.—A white fibrous diaphragm situated 2 cm. under the vocal chords and perforated with an oval passage.

the trachea and the cricoid were opened and a drain was introduced and fixed. Five weeks later, the drain was removed in suspension laryngoscopy, and she was cured; when examined four years later, she was all right.

Case 15.—A woman, aged 24, at the age of 3 years, had undergone tracheotomy for croup, and had worn a cannula for six months. She was now suffering from increasing shortness of breath caused by a white fibrous diaphragm situated about 2 cm. under the vocal cords and perforated by an oval passage (fig. 18).

On Jan. 14, 1922, under local anesthesia, a tracheofissure was made through the old tracheal fistula, which partly reached the cricoid. The fibrous diaphragm was removed by means of cutting forceps, drain no. 40 was introduced and fixed with wire and the wound closed at once. After eleven days, the tube and the wire were removed through the mouth by indirect laryngoscopy and the patient was sent home cured.

With regard to the remaining eleven patients with chronic laryngostenosis, who were all cured by means of the translaryngeally fixed

drain, I shall not go into details, but only mention them shortly as follows:

Four patients (nos. 3, 5, 6 and 8) suffered swelling of the wall due to perichondritis of the cricoid, caused by the cannula being placed too high up. One of these (no. 5) had worn the cannula for fifteen years, in spite of repeated attempts to get rid of it. After a drain had been introduced by laryngofissure, had been fixed and had remained in position for a month according to my method, he was cured definitely.

Two patients (nos. 4 and 18) had a complete fibrous agglutination of the walls 1 cm. under the rima glottidis.

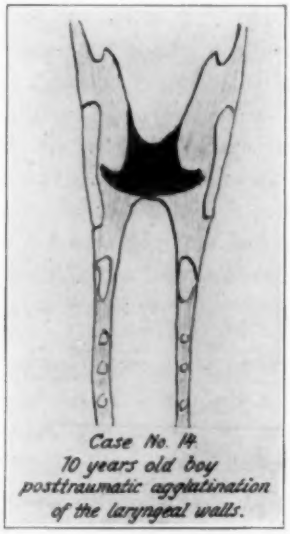

Fig. 19.—An extensive agglutination of the walls of the larynx due to a traumatic fracture of the thyroid.

One patient (no. 9), on whom a cricothyroidotomy had been performed instead of a superior tracheotomy had a complete fibrous agglutination below the vocal cords.

The stenosis of one patient (no. 11) was caused by necrosis of the laryngeal cartilage due to postoperative perichondritis of the thyroid.

One patient (no. 14) had an extensive agglutination of the walls of the larynx due to a traumatic fracture of the thyroid (fig. 19).

This patient was a boy, aged 10, who six weeks before had fallen against the edge of a bench and hit his throat. A week later he had an attack of sudden suffocation, and tracheotomy was performed at a country hospital. It had not since been possible to remove the cannula.

After the laryngofissure it was found that there was an infraction of the right half of the thyroid, and that the false and the true vocal cords, as well as the whole of the sinus Morgagni, were agglutinated by

fibrous masses, so that it was impossible to distinguish the different parts. An incision was made through the fibrous masses, and drain no. 30 was introduced and fixed translaryngeally. The drain remained in place in the larynx for two months, and was then, by a new laryngofissure, exchanged for drain no. 33. This was removed through the mouth after two and three-quarter months. The boy was then completely cured, with the cannula removed, and had a good voice (fig. 19).

Finally there was one patient (no. 16) with a severe syphilitic perichondritis, and one patient (no. 17) with an extensive postoperative (galvanocaustic) agglutination of the vocal cords.

ADVANTAGES OF THE METHOD

The great advantage of this treatment is that it causes the patient so little inconvenience, if the drain is put in the right place. The frequent, often daily, exchange which was necessary in all methods founded on the introduction of bolts either from the mouth or from below, is completely avoided by my method. The drain once placed in position can remain there for weeks and months without causing any reaction. The patient can be sent home to come back months later in order to have the tube changed or removed. If the tube has to be changed this is, of course, performed by means of a laryngotomy or a tracheotomy; but this is done in children under general anesthesia or in adults under local anesthesia.

This exchange may be necessary in cases in which the upper end of the tube protrudes above the superior aditus laryngis, so that the patient cannot drink without the fluid running down into the windpipe and being coughed out through the tracheal cannula.

In this case, one must open the wound, remove the wire, move the drain a little farther down toward the trachea and transfix it in its new position.

To avoid this inconvenience one ought always, either by exploring with the finger through the mouth or by examination in suspension laryngoscopy, to make certain that the upper end of the tube is in correct position in relation to the upper entrance of the larynx and only then close the wound in the larynx.

Another advantage of this treatment is its comparatively short duration.

With the exception of three unusually serious cases of laryngeal stenosis (nos. 4, 9 and 16), in which the drain had to remain in position six months, nine months and eleven months, the dilations took only from one to ten weeks, as follows: one patient cured after one week; one after three weeks; three after four weeks; one after five weeks; two after six weeks; three after seven weeks; one after eight weeks; one after nine weeks, and two after ten weeks.

The average time of treatment for these fifteen patients was about six weeks, and in most of the cases I had to do with solid stenoses, some

of them with complete diaphragmatic synechias of the laryngeal and tracheal walls.

Often the treatment may be considered finished when, after laryngofissure, the drain is fixed in its proper position and the causes of the stenosis have been removed by operation. A few days after the operation, the external wound is healed, the wire that fixes the tube is concealed under the skin, swallowing is easy and natural, and the patient can move about with his cannula as a safeguard against respiratory difficulties, or, in the case of an adult, without it; for in the latter, the tube—which is of the size of a finger (filière nos. 33 to 40)—is so wide that there is always free respiration through the tube.

I often find that the stenosis, on removal of the tube after two weeks or a month, has been sufficiently dilated, so that the drain can be removed and the tracheal fistula closed.

Sometimes I find that the passage through the larynx has not become sufficiently free, and that the operation has to be repeated and a drain larger than the one used after the first operation introduced. With just a few exceptions, this treatment has been successful, the drain having been left in position for a month or so. Should this second operation not be quite satisfactory it must be repeated, the size of the tube being increased each time. In this manner, I succeeded in entirely curing a patient with a severe syphilitic perichondritic stenosis, but the operation had to be repeated five times and the size of the tube increased from filière no. 20 to no. 39. This patient lived at a considerable distance from Copenhagen; she could do all her work with the tube in position and had to come to Copenhagen and stay in the hospital only when the tube was to be changed.

This method necessitates a certain amount of surgical skill, especially with regard to placing the tube in the right position. These difficulties, however, are lessened after one has tried the operation a few times, and I am confident that any one who has had the opportunity to use this method will come to the same conclusion that I have, that there is no method which so surely, quickly and safely will produce cure of even the severest cases of laryngeal and tracheal stenosis as this which I present to you.

FURTHER REPORT OF CASES

My material, as has been stated, includes in all eighteen cases of stenosis of the larynx. Of these the first six were published at the First Scandinavian Otolaryngological Congress in Copenhagen in 1911. The next five were reported by Salomonsen in *Nordisk Tidsskrift for Laryngologi* (**1**: 513, 1916), and the last seven were published in the Proceedings of the Inter-State Post Graduate Medical Assembly of North America, 1928, with the exception of one case, which was demonstrated in the Danish Otolaryngologic Society. These last seven cases are described here. I also give a schematic review of the eighteen cases of

Summary of Eighteen Serious Cases of Stenosis in which the Author's Method of Treatment Produced Cures

Case	Age, Sex*	Cause of the Stenosis	Duration	The Nature and Position of the Stenosis	Treatment	The Tracheal Cannula	The Rubber Tube	Remarks
1. (1910, St. Josefs Hospital)	32 ♂	In an attempt at suicide, cut made through the thyroid cartilage with a razor	6 months	Thick diaphragm on a level with the ventricular bands	At the beginning, intubation without any result; afterward, excision of the diaphragm twice in a surgical ward, with the result that the stenosis got worse; then a rubber tube, F. no. 39, was introduced	Was not removed after the operation	Remained in position 9 weeks in all (in two periods 5 and 4 weeks)	
2. (1908, St. Josefs Hospital)	3 ♂	Tracheotomy (croup)	4 weeks	1 cm. thick diaphragm on a level with the cricoid	Began with laryngotomy, followed by 10 months' intubation without improvement; 8 months later, the larynx and trachea were split (10/19/09) and tube no. 18 was introduced; 11/18, changed with no. 21; sent home cured, 1/29/09; no relapse	Was not removed during treatment	Remained in posion 10 weeks in all (in two periods 4 and 6 weeks)	Scarlet fever at age of 14 during which he suffered from difficulties of respiration and was admitted to the university clinic (see case 12)
3. (1909, St. Josefs Hospital)	2 ♂	Tracheotomy (croup)	5 weeks	Perichondritic stenosis at the level of the cricoid	First, 8/4/09, inferior tracheotomy, followed by intubation during 5 months without effect; 1/24/10, laryngotomy with introduction of rubber tube no. 20, which was exchanged on 2/16 with tube no. 23; 6/25, the cannula was removed	Was not removed during treatment	Remained in position 6 weeks (in two periods of 3 weeks each)	Is a good illustration of the fact that not all patients with stenosis due to a high tracheotomy and perichondritic thickening of the cricoid can be cured by inferior tracheotomy and intubation
4. (1910, St. Josefs Hospital)	11 ♀	At age of 3 tracheotomy during scarlet fever	8 years	Complete fibrous agglutination of the larynx 1 cm. below the vocal cords	Several years' treatment with laryngotomy, Mikulicz glass tubes and intubation by means of which the larynx was partly canalized, but patient could not breathe without the cannula; autumn, 1910, the stenosis was split and tube no. 35 introduced; remained in position 3 months; spring, 1911, tube no. 38 was laid in for 3 months	Removed immediately after introduction of tube	Remained in position 6 months (in two periods of 3 months each)	She could stay at home during the treatment and do her work because she was able to breathe freely through the tube which had the thickness of a finger
5. (1910, St. Josefs Hospital)	17 ♂	Tracheotomy (croup)	15 years	Perichondritis of the cricoid diaphragmatic formation	Had worn tracheal cannula 15 years; during this time repeated attempts at removal were made; 8/11/10, inferior tracheotomy; inferior part of larynx split and stenosing masses removed; tube no. 34 laid in; remained in for a month	Was not removed during treatment	Remained in position 1 month	
6. (1911)	6 ♂	Tracheotomy (croup)	5 years	Perichondritis of the cricoid	Tracheal fistula split upward, so that the stenosis could be examined; tube no. 28 introduced 3/1/11; exchanged with no. 29 on 3/24	Was not removed during treatment	Remained in position 40 days (in two periods of about 20 days each)	
7. (1911, University Clinic)	5 ♀	Tracheotomy (croup)	3½ years	Fibrous diaphragm above the tracheal fistula perforated in its posterior part	Larynx and trachea split; excision of the diaphragm; tube no. 28 introduced	Removed at once, but had to be replaced on account of respiratory difficulties	Had to be readjusted on account of respiratory difficulties; was worn 49 days	

8. (1912, University Clinic)	1½ ♀	High tracheotomy (cricothyroidotomy	4 weeks	Perichondritis of the cricoid cartilage, subvocal polyp	7/1, inferior tracheotomy without effect, 8/6, laryngofissure; polyp removed; tube no 22 introduced	Removed 4 days after the operation, but had to be reintroduced 4 days later on account of respiration difficulties	Remained in position 20 days	
9. (1916, St. Josefs Hospital)	5 ♂	Cricotracheotomy	3¼ years	Complete fibrous diaphragmatic agglutination at the level of the cricoid cartilage	5/8/16, laryngeal stricture split; tube no. 30 introduced; 5/30, tube had to be readjusted; 6/29, tube removed by laryngofissure; 8 days afterward, tube no. 33 introduced, and 3 months later removed and a new tube introduced; sent home with the tube in larynx; tube removed 2/1/17	Not removed during treatment	Remained in position for 9 months, but was replaced 5 times by tubes of a larger size	A very difficult case but treatment successfully carried out
10. (1914, St. Josefs Hospital)	6 ♀	Tracheotomy, multiple papillomas	3 years	Vocal cords partly agglutinated	Thyroidotomy; splitting of the diaphragm between cords; tube no. 23	Not removed during treatment	Remained in position 28 days	
11. (1911, University Clinic)	56 ♀	Perichondritis and necrosis of the thyroid cartilage	.....	Perichondritis and necrosis of the thyroid cartilage	Thyroidotomy; tube no. 38 introduced	Not removed during treatment	Remained in position 51 days (in two periods)	The tube method was here employed to prevent collapse of the larynx after removal of the necrotic part of the thyroid cartilage
12. (1918, University Clinic)	14 ♂	Tracheotomy	11 years	Diaphragm	Formerly treated (case 2) by the tube method, 1909, and sent home cured, but stenotic symptoms appeared in 1911 during scarlet fever; 7/9/18, diaphragm extirpated by laryngofissure; tube no. 30 introduced, exchanged 7/4 with no. 32	Not removed during treatment	Remained in position 2 months	
13. (1920, University Clinic)	4 ♀	Congenital diaphragm	4 years	Diaphragm below the rima glottidis	Stridulous respiration since birth; tracheotomy 4 months before admittance to clinic; 10/14, inferior tracheotomy; 1/20/21, laryngofissure; drain no. 23 introduced	Not removed during treatment	Remained in position for 5 weeks	Fine result after only one introduction of tube; wore tracheal cannula for 1¾ years before it was removed
14. (1919, University Clinic)	10 ♂	Trauma	6 weeks	Fracture of thyroid cartilage; complete agglutination of the walls of the larynx	7/8/19, laryngofissure; tube no 30; 9/17, readjustment tube no. 33	Not removed during treatment	Remained in position 2¾ months	Fine and quickly gained result
15. (1922, University Clinic)	24 ♀	Tracheotomy (croup)	19 years	Diaphragm below rima glottidis	1/14/22, laryngofissure; excision of diaphragm; tube no. 40 introduced; wound closed at once	Removed at once	Remained in position 11 days	
16. (1923, University Clinic)	24 ♀	Syphilitic perichondritis	1 year	Perichondritis of the cricoid cartilage	Laryngofissure performed five times during 1¾ years with introduction of drains of increasing size (from no. 29 to no. 30)	Not removed during treatment	Remained in position 14 months in all (with 5 readjustments)	Difficult case
17. (1924, St. Josefs Hospital)	36 ♀	Caused by removal of papillomas	1½ years	Synechia of the vocal cords	1/15/24, inferior tracheotomy; tube no. 40	Removed at once	Remained in position 1 month	
18. (1927, University Clinic)	..	Caused by treatment of papillomas with x-ray	4 years	Complete synechia of the larynx	7/30/22, superior tracheotomy on account of papillomas; 4/12/25, inferior tracheotomy; stenosis split; tube no. 23; scarlet fever; 3/12/26, laryngofissure, tube no. 26; readjustment 4/8/26; removed 5/23	Not removed during treatment	Remained in position 46 days in all (two periods)	The tube slipped down into the bronchus during change of cannula, but was easily removed by direct bronchoscopy

* In this column, ♂ indicates male; ♀, female.

chronic stenosis of the larynx, treated by means of the translaryngeal method of fixing the tube.

CASE 12.—Edward J., aged 14, admitted Feb. 7, 1918, was tracheotomized at the age of 3 years during an attack of croup at the hospital in Korsor. He was in my ward at St. Joseph's Hospital in Copenhagen from March 3, 1908, to April 19, 1909, and again from Oct. 25, 1909, to Jan. 29, 1910, for stenosis laryngis as a sequel of tracheotomy. Inferior tracheotomy, direct laryngoscopy, laryngofissure and dilation with tubes were performed. By this treatment the cannula was definitely removed.

On Dec. 29, 1910, he returned to the hospital with attacks of suffocation, and the tracheal cannula was introduced. The next day he was removed to the hospital for epidemic diseases with scarlatina. While he was here in my ward from March 15 to Aug. 5, 1911, the tracheal tube was removed and the fistula closed. After that he kept well, but if he cought cold or ran too fast there were difficulties in breathing, sometimes rather severe. He came to my ward on July 2, 1918, to be treated for this difficulty in breathing. On July 4, the cannula was replaced in the old cicatrix and a fibrous impediment to passage was discovered under the vocal cords on a level with the cricoid cartilage—the lumen of which was about 3 mm. On July 9, 1918, I performed laryngofissure—whereupon the diaphragm causing the stenosis was removed with sharp forceps and tube no. 30 was introduced and fixed. The wound was closed. On July 29, he was well and was sent home with the tube in situ. He returned on Jan. 4, 1919. He had kept well. Respiration through the tube was possible, but difficult. On September 7, I performed laryngofissure. I removed the tube and replaced it by no. 32 on September 14. An examination in suspension laryngoscopy showed that the tube reached too far into the aditus superior laryngis, and that fluids could run down into the larynx and the trachea. The tube together with the silver wire was removed through the mouth on March 20, 1919. He has been well since. The tracheal fistula is closed. The respiration through the larynx is unobstructed. The voice is practically natural.

CASE 13.—Else H., born Oct. 9, 1916, had had, since birth, respiratory stridor and hoarse voice. She was treated at Esbjerg Hospital from Dec. 5 to Dec. 15, 1918, for croup—readmitted June 12, 1920. On June 23, 1920, she suffered a violent attack of suffocation—superior tracheotomy was done hurriedly in the hospital. She was treated later in my ward for removal of the tube. Laryngofissure and suspension laryngostomy showed, 1 cm. below the glottis, a circular fibrous diaphragm, the central lumen about 4 mm. The tracheal tube of 7 mm. could not get past the stenosis.

On Oct 14, 1920, an inferior tracheotomy was performed, since the first cannula was too high up, nearly in the cricoid cartilage.

On Jan. 20, 1921, in a laryngofissure the trachea and the cricoid cartilage were cut through. The part above the cannula was partly closed up by fibrous thickening of the walls. Tube no. 23 was introduced and fixed by silver wire—the ends of which were covered by the skin. The correct position was verified by suspension laryngoscopy. There was free respiration through the tube. The tracheal tube was placed in position. On February 26, the cannula was removed in suspension laryngoscopy through the mouth (in narcosis). The stenosis had entirely disappeared, and the walls of the trachea were smooth, with a natural lumen. On May 14, it was verified by suspension laryngoscopy that there were only slight remains of stenosis in the trachea; a tracheal tube 7 mm. long passed easily. On Nov. 20, 1922, the passage through the larynx—the cannula being closed—was free and on November 27, the cannula was removed.

The patient, with the exception of slight granular formations around the tracheal fistulae continues well, and without the cannula. She was last seen in 1925.

CASE 14.—Anker J., aged 10, admitted to the hospital on June 28, 1919, fell and hit his larynx against the edge of a bench six weeks before. Eight days later, shortness of breath developed. A tracheotomy was performed in a country hospital. The cannula could not be removed. The larynx was quite blocked for breathing and sounding in suspension laryngoscopy. On July 8, in a laryngofissure, the infraction of the right thyroid cartilage was verified. The inferior aditus was normal, but the false and true vocal chords, as well as the sinus Morgagni, were agglutinated by fibrous masses, so that it was impossible to distinguish the different parts. In other words, the larynx was completely closed by a fibrous diaphragm the lower border of which was on a level with the rima glottidis.

The fibrous masses were cut through and a rubber tube 4 cm. long (filière no. 30) was introduced and fixed; the position of the tube was controlled by suspension laryngoscopy. The outer wound closed at once. The patient was well during two months, with free respiration through the rubber drain with closed cannula.

On September 5, a suspension laryngoscopy was performed. The rubber tube with the wire was removed through the mouth. On September 9, there was free respiration through the larynx with blocked cannula. After a slight attack of shortness of breath, rubber tube no. 33 was laid in by means of laryngofissure and transfixed by wire. This was removed on October 16 by suspension laryngoscopy.

On October 18, the tracheal cannula was removed. The boy continued well, and his voice was good.

CASE 15.—Anna C., aged 24, admitted Jan. 10, 1922, had been tracheotomized at the age of 3 years during an attack of croup. Tracheotomy had to be performed again on account of shortness of breath after the removal of the cannula and healing of the tracheal fistula. She was dismissed again without the cannula after six months in the hospital.

Two months previous to my seeing her, she had acute tonsillitis, hoarseness and difficulty in breathing, but no suffocation. The symptoms continued. By laryngoscopic examination, a white fibrous diaphragm was found about 2 cm. below the rima glottidis. The diaphragm was perforated by an oval opening a little to the right. The vocal chords did not move freely.

On Jan. 14, 1923, with the patient under local anesthesia, a laryngofissure was made through the old tracheotomy scar, which went partly through the cricoid. The fibrous diaphragm was removed with punch forceps, and rubber drain no. 40 was introduced and fixed with wire. The wound closed at once. In the following days there was difficulty in swallowing. Salt water was injected subcutaneously. The temperature was slightly elevated and there was some purulent expectoration. The patient breathed easily through the drain in the larynx and, except for the first few days, she swallowed easily. On January 25, the drain and wire were removed through the mouth by indirect laryngoscopy. On March 10, she was examined and the passage through the larynx was free.

CASE 16.—A. C., aged 24, admitted Jan. 19, 1923, had syphilitic stenosis of the larynx. On Jan. 22, 1922, she felt sudden pains in her throat. On March 13, she suffered an attack of suffocation so sudden and violent that tracheotomy was performed at the last moment. In May, a sample of blood gave a positive Wassermann reaction. She bore a healthy child on October 3. She had had nine

intravenous injections of neo-arsphenamine, and twenty mercury inunctions which were given up on account of stomatitis. An examination in my ward showed the parts above the vocal cords normal, respiration through the larynx insufficient because there was only a small narrow opening at the back of the rima, and the vocal cords, toward the front, immovable and close together. The voice was hoarse, without tone; a thin sound could be passed into the trachea from above. The expiration was fairly easy—inspiration was unsuccessful.

On Feb. 24, 1923, in a laryngofissure under local narcosis through the thyroid cartilage, a fibrous, ring-shaped stenosis was found under the rima glottidis. This obstruction was opened in front, without injuring the cricoid cartilage, and rubber tube no. 20 was introduced and fixed laryngeally. Treatment with neo-arsphenamine was carried out.

On March 24, a laryngofissure (under local narcosis) was done and the old tube was removed and easily replaced by no. 32—without a reopening of the stenosis. The patient reported that she had felt well during the intervening month.

On March 30, she was sent to her home, where she remained for more than six weeks. She was admitted again on May 9, for a continuation of the treatment. She had been well, but four days before her return the tube had got loose and she had had to spit it out.

On May 14, a laryngofissure was performed, but as the stenosis was nearly on a level with the cricoid cartilage, it was opened in front, from the inside, and drain no. 32 was introduced and fixed translaryngeally—the ends of the wire being covered by the skin.

Swallowing was difficult for a few days and afterward easy. On May 24, the patient left for home with the drain in position and she remained there until August 29.

Respiration through the larynx had been free, but the day before readmittance to the ward she felt that the tube suddenly slipped upward. The tube was removed through the mouth. There was much better room in the larynx especially for expiration. The voice was sonorous and deep, and she spoke easily with the blocked cannula. There was no sensitiveness or change of the form of the larynx.

September 8, a laryngofissure was made with the patient under local narcosis; tube no. 33 was introduced and transfixed. On September 23, by laryngofissure, the tube was exchanged for no. 38. The patient was sent home on October 8 and readmitted on Jan. 6, 1924. She had been well all the time, breathing and swallowing freely.

On Jan. 18, 1924, in laryngofissure, the tube was removed and replaced by no. 39. The patient was sent home until April 24. On April 25, the tube was removed in indirect laryngoscopy. The rima glottidis was now of natural size, the passage through the larynx was normal and the breathing was free with the cannula blocked. The patient was sent home with the cannula blocked on May 14, and was readmitted October 15. The cannula was permanently removed October 28.

On November 4, the tracheal wound was reduced to a small opening. Respiration through the larynx was sufficient; there was no sound of stenosis when she slept. The voice was sonorous, rather deep and slightly hoarse.

CASE 17.—Margrethe J., aged 36, admitted to the hospital on Jan. 11, 1924, though formerly healthy, had become hoarse about one and one-half years before. She had consulted a specialist, who informed me that she suffered from papillomas on the vocal chords. She was treated by galvanocautery, the last time four months before admission, and after this had been very hoarse. There were no symptoms of stenosis. She was almost aphonic. Laryngoscopic examination

showed agglutination of the vocal chords, which were injected and swollen. On Jan. 15, 1924, tracheotomy was done with the patient under local anesthesia, and thyroidotomy. The vocal chords were found to be agglutinated to a great extent. The wound corresponded to half the length of the chords. A rubber tube (filière no. 40) was introduced and fixed translaryngeally below the vocal chords by wire.

The outer wound was entirely closed, the tracheal cannula was removed, and the correct position of the tube was verified by means of the laryngoscope.

During the first two days, the patient received subcutaneous injections of salt water, and could eat only gruel; but on the following days she could swallow all fluids. On January 24, the rubber tube was removed through the mouth.

On March 1, laryngoscopy showed natural conditions. On March 17, she was dismissed with a normal voice and normal vocal chords. The same condition was found half a year later.

CASE 18.—Verner U., aged 6 years, admitted Feb. 28, 1927, had been previously admitted (July 30, 1922) on account of laryngeal stenosis caused by multiple papillomas. At that time he was 1½ years old. A fortnight before this first admission he had been tracheotomized in a provincial hospital on account of suffocation. I tried three times in the course of the autumn of 1922 to remove the papillomas in suspension laryngoscopy, but the growths continually recurred, so that he had to be sent home with his tracheal cannula on Dec. 26, 1922. After six months, he returned unimproved and was treated with x-rays. Six months afterward the papillomas had disappeared, but in spite of this the larynx was stenosed, which I judged to be the result of a cricoid swelling due to the high position of the tracheotomy.

I now waited two years. Then, on April 12, 1925, I found that the larynx and the rima glottidis were natural, the chords moving freely, but that a little below the vocal chords there was a solid fibrous stenosis. A tracheotomia inferior was done and the old tracheal fistula was split upward. This disclosed a high fibrous stenosis of the trachea of about 5 mm. The larynx over this stenosis was perfectly normal. Rubber tube no. 23 was introduced and fixed translaryngeally and the outer wound was closed primarily. The patient was well for one month; then he got scarlet fever and had to be removed to the hospital for epidemic diseases, where he remained for two months. He returned to the university clinic where, in changing the tracheal cannula, the tube, after having lain for three months in the stenosis, accidentally slipped down into the trachea and was removed through the tracheal fistula. The boy was sent home. He returned for the seventh time on March 2, 1926. The larynx was free from papillomas, but below the chords there was a complete fibrous agglutination of the walls of the trachea. On March 13, a laryngofissure was made and the stenosis cut out in order to reestablish the lumen. Rubber tube no. 26 was introduced and fixed translaryngeally. The tube had to be removed the following day because it was placed too high up, so that milk and other fluids ran into the trachea.

Three weeks later, on April 8, a new tube, no. 23, was introduced and its right position was verified by means of suspension laryngoscopy. On May 23 the tube was removed in suspension laryngoscopy. On June 17, a good passage was had through the larynx with the cannula blocked, even after running. The patient was sent home. On Feb. 28, 1927, he was reexamined. He had been well since leaving the hospital. He wore a blocked cannula and spoke loudly and clearly. The cannula was removed at the beginning of March, and he was sent home in the spring of 1927 perfectly well and with a good voice.

THE OPEN EUSTACHIAN TUBE*

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The eustachian tube is the only channel of communication between the nasopharynx and the middle ear for the purpose of equalizing the pressure of the external air and that contained in the middle ear. Unfortunately, this tube is also the most common avenue of approach of infection to the middle ear. It is a recognized fact that any pathologic nasal condition, such as acute and chronic rhinitis, hypertrophied turbinates and deviated septum and adenoids, predisposes to diseases of the middle ear (catarrhal deafness and acute and chronic suppurative otitis media and its complications).

The middle ear is aerated only when the eustachian tube is opened, which takes place during the act of deglutition or phonation with a letter which tends to bring the soft palate upward and backward (ka). The tube is otherwise closed, so intended by nature to protect the middle ear from unnecessary exposure from the nasopharynx. One can readily see that if the tube is kept constantly open by pathologic means, the middle ear is subjected to greater danger of infection. Especially when the patient is asleep and the head is inclined to one side, mucus from the nasopharynx easily gravitates to the middle ear through the open tube. The epithelial covering then becomes thickened, and fibrous tissue is deposited in the subepithelial layers, causing obstruction in the eustachian tube and ankylosis of the ossicles.

My purpose in this paper is to point out a new cause of a pathologically open eustachian tube. Before an analysis is made of the causes of the open eustachian tube, it is advisable to review briefly the structure and the movement of the pharyngeal portion of the tube.[1]

When one examines the nasal orifice of the eustachian tube with the aid of a nasopharyngoscope, one sees a vertical slit (fig. 1). The tube is closed. During the act of swallowing or when the patient says "ka," the soft palate rises. There is also a concomitant movement of the ala tuba (fig. 2) which is in proportion to the palatal movement. The ala is seen to rise, moving inward and backward, and at the same time the mouth of the tube changes its shape from a nearly vertical slit to a

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1. Sohier, Bryant W.: The Eustachian Tube: Its Anatomy and Its Movements, M. Rec., June 8, 1907. The diagrams, copied from the same article, were drawn by Dr. A. Braun (permission granted).

triangular opening, formed by the backward movement of the posterior wall or the closed tube. The anterior wall remains stationary. The inferior wall of the open tube is formed by the stretched inferior commissure.

The posterior part of the pharyngeal portion of the tube is composed of a plate of right triangular cartilage, which also forms the greater part of the anterior wall of Rosenmüller's fossa. The upper border of the cartilage is attached to the skull and fits into a depression in the sphenoid bone. The right angle of the triangle is situated at the pharyngeal end of the upper border of the cartilage. The inner border of the triangle forms the short limb or vertical side. It is also the free border of the cartilage and forms the torus tubarius. The third and lower side of the triangle is freely movable. The hamular process is also

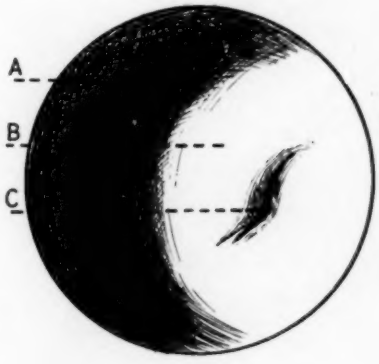

Figure 1

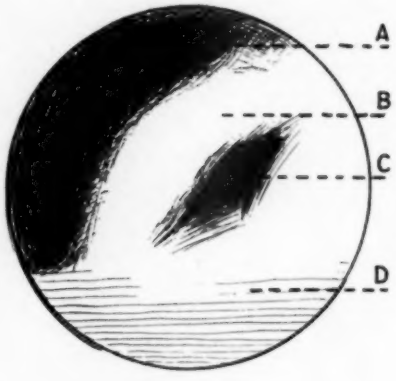

Figure 2

Fig. 1.—The pharyngeal orifice of the left eustachian tube as seen with the aid of a nasopharyngoscope, when at rest. *A*, fossa of Rosenmüller; *B*, torus tubarius, and *C*, mouth of tube closed.

Fig. 2.—The same as figure 1 but during the act of swallowing. The upper surface of the soft palate occupies the foreground. The fossa of Rosenmüller is nearly closed by the backward and upward movement of the alar cartilage, which has distended the tube. *A*, fossa of Rosenmüller; *B*, torus tubarius; *C*, mouth of tube opened, and *D*, soft palate.

a portion of the triangular cartilage and forms a small portion of the anterior wall of the tube. The cartilage and its attachments are elastic and yield readily to pressure, which allows fairly free movement. The greater part of the anterior wall of the tube is a strong membrane. The lower wall of the open tube is a loose elastic sheet of fibrous tissue which contracts and folds together when the tube is closed.

The anterior wall of the tube rests on the tensor palati muscle and that in turn on the levator palati muscle and the intervening fascia

(fig. 3). The pharyngeal osteum rests against the posterior surface of the pterygoid process. This backing prevents the collapse of the anterior wall.

The fibers of the levator palati and the tensor palati muscles both run parallel with the long axis of the tube. The levator palati muscle is chiefly responsible for the opening of the eustachian tube, for its

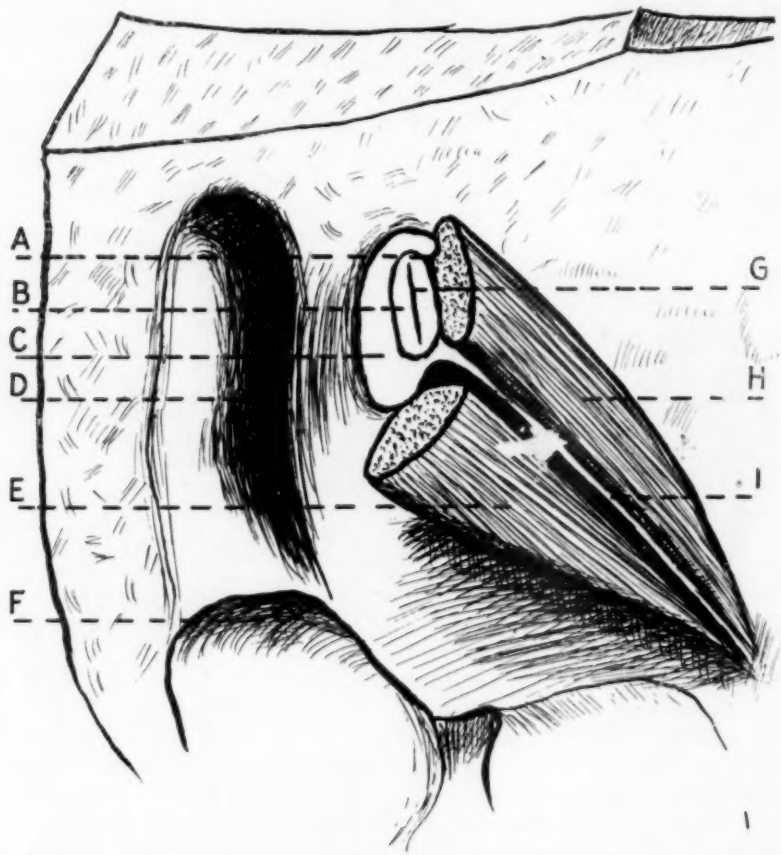

Fig. 3.—The left tube at a cross-section. Two millimeters of the pharyngeal end has been removed. The fibers of both tensor and levator muscles are seen running parallel to the tube and are separated by the salpingopharyngeal fascia. The levator palatine is seen resting on the anterior surface of the angular process of the cartilage. *A*, hamular process of triangular cartilage; *B*, mucous membrane lining the tube; *C*, triangular cartilage; *D*, fossa of Rosenmüller; *E*, levator palatine muscle; *F*, glenoid fossa; *G*, section of closed tube; *H*, tensor palatine muscle, and *I*, fascia between tensor and levator palati muscles.

inner extremity is attached to the muscular mass of the velum palati and moves with the soft palate. When the soft palate is relaxed and hangs forward, the palatal attachment of the levator is drawn down-

ward and forward (fig. 3). If the palate is drawn upward and backward, the inner attachment of the levator palati muscle pushes the alar cartilage backward, upward and inward, opening the pharyngeal orifice of the tube (fig. 4).

In the treatment for chronic suppurative otitis media [2] and for the so-called chronic catarrhal deafness,[3] a catheter is introduced into the

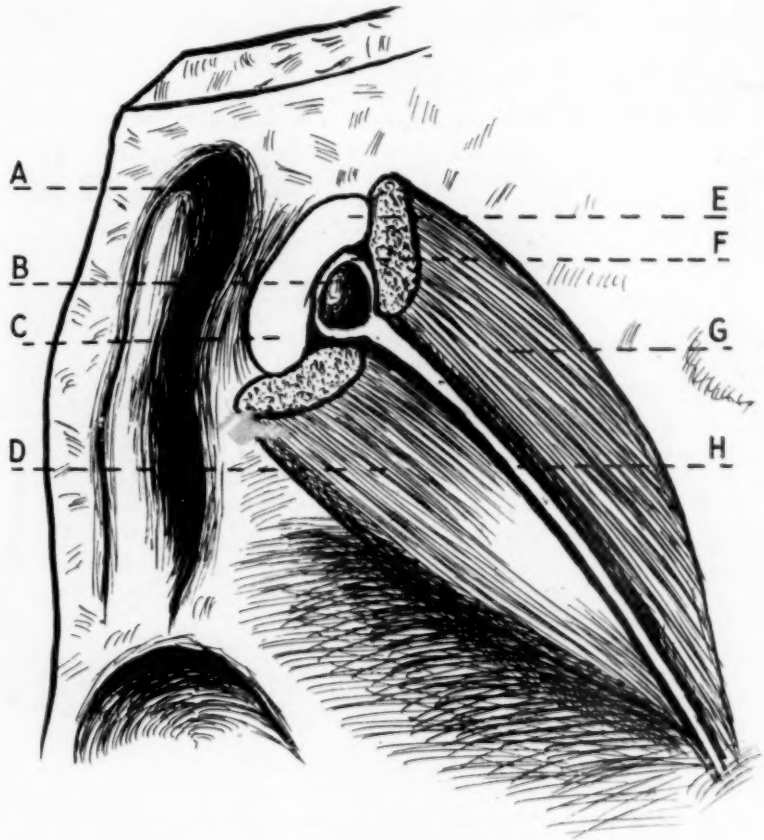

Fig. 4.—The same as figure 3, but the levator palati has been drawn upward and backward into the position it occupies when the soft palate is raised. It now pushes the angular process of the cartilage upward and backward, encroaches on the lumen of the fossa of Rosenmüller and opens the tube. The anterior wall of the tube remains fixed. *A*, fossa of Rosenmüller; *B*, section of the tube opened; *C*, cartilaginous portion of the tube; *D*, levator palatine muscle; *E*, hamular process of the triangular cartilage; *F*, membranous portion of the tube; *G*, tensor palati muscle, and *H*, fascia between tensor and levator palati muscle.

2. Pitman, L. K.: New York State J. Med. **27**:1061 (Oct. 1) 1927.

3. Pitman, L. K.: Suggestions Regarding Treatment of Conditions Ordinarily Included Under Chronic Catarrhal Otitis Media, Arch. Otolaryng. **8**:70 (July) 1928.

eustachian tube under direct vision with the aid of the catheterizing eustachioscope. This offered the opportunity to examine thoroughly the nasal orifice of the eustachian tube and its movements. In a great many cases it was observed that although the soft palate was relaxed and hanging forward, the tube was open and triangular in appearance (fig. 2). No movement of the alar cartilage took place during the act of swallowing or phonation with the syllable "ka." The tube was therefore pathologically open.

PATHOLOGIC CAUSES

1. The literature calls attention to the fact that adhesive bands running from the posterior border of the eustachian tube, bridged across

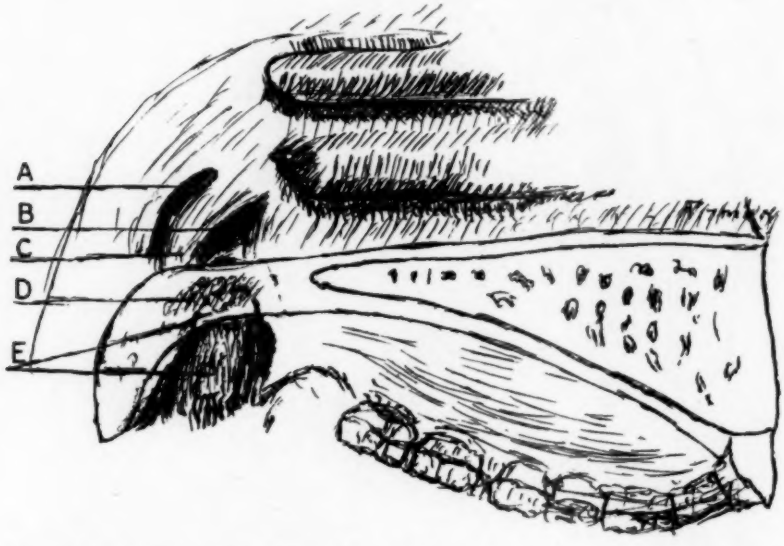

Fig. 5.—Schematic sagittal section, showing pathologic open eustachian tube when the soft palate is at rest. The hypertrophied tonsil is seen pressing against the levator palati muscle keeping the eustachian tube constantly open. *A*, fossa of Rosenmüller; *B*, orifice of the open eustachian tube; *C*, torus tubarius; *D*, levator palati inserted in soft palate. The palate is relaxed, and *E*, hypertrophied tonsil. The dome of the tonsil pushes the levator palati muscle upward, keeping the tube constantly open.

the fossa of Rosenmüller and attached to some portion of the nasopharynx, would retract the posterior wall of the eustachian tube backward, thus causing the tube to be kept open. The explanation was logical, but I was not satisfied for the following reasons: (*a*) The majority of these cases gave no history of any previous nasal pharyngeal operation or any preexisting inflammatory condition. (*b*) Adhesions would cause some sort of puckering visible on the torus tubarius of the eustachian

tube, due to the pull. There was no distortion; the opening was triangular and of normal appearance.

2. Paralysis of the levator palati muscle was at once ruled out, for the soft palate functioned normally.

3. A hypertrophied tonsil is a well known etiologic factor for impairment of the middle ear, which is usually ascribed to hyperemia of the surrounding tissue or to that of focal infection. In a conscientious review of the literature, I have failed to find an embedded hypertrophied tonsil given as a cause for an open eustachian tube. This I found to be so, on account of its anatomic position, for the

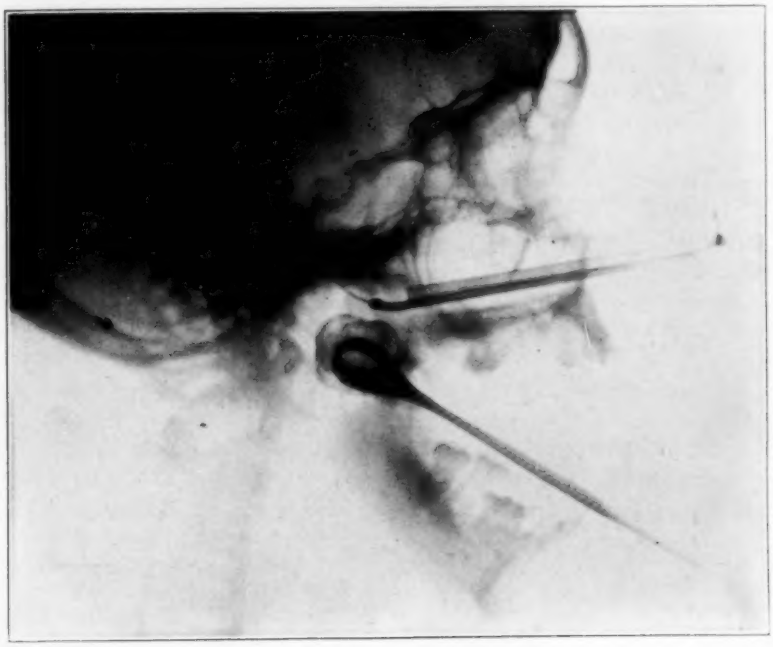

Fig. 6.—Lateral roentgenographic view of skull. X-ray catheter introduced in eustachian tube with the aid of catheterizing eustachioscope. The nasopharyngoscope has been removed. On the same side, in the tonsillar fossa, immediately after tonsillectomy, a sponge dipped in barium paste is replaced. The dome of the tonsillar fossa is seen to be in close relation to the mouth of the eustachian tube.

inner extremity of the levator palati muscle is immediately above the dome of the tonsil. One can readily see that a high-domed hypertrophied tonsil, on account of its upward pressure, tends to elevate the levator palati muscle, which in turn pushes the alar cartilage backward, upward and inward, and causes the pharyngeal orifice of the tube to remain open.

A simple experiment will demonstrate this to be true. Examine a patent eustachian tube with a nasopharyngoscope and then remove the hypertrophied tonsil on the same side. Examine again the orifice of the tube, and it will be seen that it has tended to close. While the movement of the tube is being observed, place in the tonsillar fossae a sponge attached to a sponge holder. While the sponge is in situ, the tube is seen to be opened, and when the sponge is removed the tube tends to close.

It would thus seem that hypertrophied tonsil may cause the eustachian tube to be constantly open.

CONSERVATIVE MODIFICATIONS OF THE LOTHROP EXTERNAL FRONTAL SINUS OPERATION *

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Skillern [1] described the technic of Lothrop's operation briefly as follows:

Preliminary to the external procedure, the front of the middle turbinate and anterior ethmoid cells are removed.

1. An incision is made similar to the Killian except not extending as far downward and outward.

2. An area of bone directly above and below the incision is denuded of periosteum and the sinus entered just above the base of the nasal process.

3. The sinus is cleared of inflammatory tissue, the periosteum, however, not being removed, and the cavity explored with a probe to determine the location of the ostium and the probe passed downward into the nose and out the anterior nares.

4. The ostium is gradually enlarged by small curets and burr drills, but only from behind forward, thus avoiding the cribriform plate.

5. A small burr is introduced through the nose and the anterior superior nasal process attacked cutting toward the nasal bone and nasal process at about their upper suture line, larger size burrs being gradually substituted.

6. The remaining ethmoid cells around the infundibulum, lachrymal bone and agger nasi are broken down and removed.

7. A large part of the inter-frontal septum is now removed, also that portion of the nasal septum just below the sinuses to the depth of about one inch.

8. External wound closed, without drain and compress bandage applied. Irrigation is to be avoided for several days.

The objections to Lothrop's operation, raised by some rhinologists, are:

1. The opposite frontal sinus is opened, even when it is normal, thus permitting infection to extend to a normal sinus.

2. An opening is made through the septum above at the same time.

3. The operative opening in the sinus is not large enough to permit extensive removal of bone in a patient with osteomyelitis.

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* Submitted for publication, Jan. 15, 1929.

* Read before the Mid-Western Section Meeting of the American Laryngological, Rhinological and Otological Society, Denver, Jan. 12, 1929.

1. Skillern: Accessory Sinuses of the Nose, ed. 4, Philadelphia, J. B. Lippincott Company, 1923, pp. 294 and 295, and figure 170 *a*.

Facts in favor of Lothrop's operation are:

1. It gives a large opening into the nose by enlargement of the nasofrontal duct. This enlargement is greater than in any other operation not excepting Halle's intranasal operation.

2. The opening into the nose, after the floor of the sinus has been removed, is more likely to remain open than with most of the other sinus operations.

3. The disfigurement is reduced to the minimum.

4. This operation need not be used for removal of sequestrums of bone. Killian's operation may be better.

Roentgenograms of the sinuses should always be taken preceding the operation: first, for thorough study of the sinus disease and complications, if any exist; and second, to show the extent of the frontal sinuses. Transillumination is of little value, as a rule, so far as determining the size of the diseased sinus is concerned.

In order to avoid the objectionable features of this operation and at the same time use the desirable, I have employed conservative modifications. This is not an attempt to claim any originality; it is a definite effort to present modifications which, I believe, are worthy of consideration. The procedure is not suitable for all cases, nor do I know of any operation which is. Some patients should be operated on by Lynch's modification of the Knapp operation, by Sewall's operation or by Killian's method. The method to be used involves a question of surgical judgment. This modification of the Lothrop is well adapted to one or both frontal sinuses.

The indications for the modified conservative Lothrop operation are as follows:

1. Failure of intranasal surgical procedure to provide adequate drainage.

2. Failure to relieve pain.

3. Threatened or actual intracranial complications.

4. Orbital or ocular complications.

5. Necessity for avoiding the scars incident to a Killian operation.

I prefer to make the incision as Lothrop[2] has advocated in his articles. After the incision in the skin has been made I leave the periosteum over the bridge, under the eyebrow, and begin to elevate the

2. Lothrop: Frontal Sinus Suppuration, Ann. Surg., June, 1914; Frontal Sinus Suppuration with Results of New Operative Procedure, J. A. M. A. **45**:153 (July 10) 1915. The illustrations on this article show the steps in Lothrop's operative technic. Treatment of Frontal Sinus Suppuration, Laryngoscope **27**:1, 1917.

periosteum above the bridge. The periosteum may be elevated over a large or a small area as desired. If it is elevated over a large area, the incision usually has to be lengthened. It is best not to expose too much bone, because the blood supply, through the periosteum, is interfered with. An opening is made through the anterior plate of the frontal sinus with an electric burr. The opening is then enlarged enough to give a view of the sinus and particularly to give enough room to pass a small electric burr down through the nasofrontal duct from above, instead of from below upward, as Lothrop advocated. A probe should be used frequently, bent so as to explore all parts of the sinus, and with good illumination. The operation, of course, is undertaken only after thorough roentgen study of the sinuses. An opening is not made through into the opposite frontal sinus unless this other side requires operation or possibly exploration. The other frontal sinus is not opened

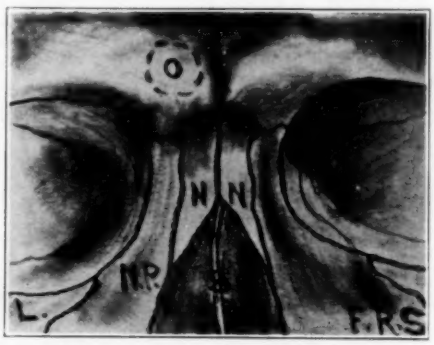

Fig. 1.—Point of election for opening the right frontal sinus in modified Lothrop operation at *O*. *N* indicates nasal bone; *N P*, nasal process of superior maxilla; *S*, septum.

routinely. Likewise, the upper part of the septum is not removed. Even when a bilateral operation is performed, I prefer not to remove the upper part of the septum nasi.

By using increasingly large burrs, the opening into the nose is made great enough to afford adequate drainage; and in this respect the technic is the same as the Lothrop. The probe should be used to find the nasofrontal duct before beginning with the smallest burr. I prefer to use the burrs, designated by Halle, from above, instead of up through the nose. This enables me to see where the burr is better than when it is introduced from below. As far as I know, my method of using the Halle burrs from above is original; I have employed it for over ten years.

The ramifications of the sinus are curetted. The bone edges should be beveled as suggested by Dr. Sam Skillern, at the Meeting of the

American Academy of Ophthalmology and Otolaryngology in St. Louis in October, 1928. The wound is closed with dermal sutures and without an external drain. A cigaret, a gauze wick, or a rubber tube drain may be used to drain the sinus into the nose, before the wound is closed, if drainage is used at all. This should be removed at the end of from twenty-four to forty-eight hours.

REPORTS OF CASES

CASE 1.—Mr. A., aged 19, first consulted me on July 9, 1915, complaining of severe pain in the forehead and above the eyes of eight days' duration. He was occasionally nauseated. This pain had occurred whenever he had taken cold for the last six years. His adenoids were removed five years before in a clinic.

Examination revealed a marked deviation of the nasal septum to the right, with a narrow right nasal fossa and a large left middle turbinate. Pus was not found in the meati. The tonsils were large, flat, red and submerged; the nasopharynx, teeth and larynx were normal. The cervical glands were palpable.

The right and left maxillary sinuses and the right and left frontal sinuses were dark by transillumination.

A diagnosis of chronic, frontal and maxillary, bilateral sinusitis, with an acute exacerbation was made.

Epinephrine was applied to shrink the turbinates, suction was used, and mild silver protein on cotton was packed in the nose. Sodium salicylate, 10 grains (0.65 Gm.) every three or four hours, was taken at home. The patient made a prompt recovery so far as the acute symptoms were concerned.

He returned on Jan. 22, 1916, with a similar acute attack, which again responded to treatment.

In July, 1916, he had a milder acute attack of pain. As soon as he recovered, I did a submucous resection of the septum and removed the left middle turbinate. He made an uneventful recovery.

His work in the oil fields of the West often kept him away for many months at a time, so that I did not see him again until May, 1917. At this time the roentgenologist reported the right frontal sinus clear and the left dull; the right maxillary sinus clear and the left cloudy; the right ethmoidal cells dull and the left slightly cloudy; the right and left sphenoidal sinuses were dull.

On account of the rather extensive involvement of so many of the sinuses, especially on the left side, I advised a Mosher operation on the left to exenterate the left ethmoidal cells and afford better drainage of the left frontal sinus. I also advised the removal of the right middle turbinate and an antrotomy on the left. This was done under local anesthesia, and he made an uneventful recovery.

As the war was in progress, Mr. A., was in the service and I was too so that I did not see him again until March, 1922. At this time he complained of severe pain following a cold. He said that he had done well for a year following the second operation in May, 1916, but that the exposure brought on in 1918 by the war had made the attacks recur. An otolaryngologist in the army had performed an operation on the right ethmoidal cells and an antrotomy on the right, with more or less temporary relief. He now wanted more done and, if necessary, an external operation. The possible necessity for the latter had been discussed with him before.

Examination revealed the absence of the right and left middle turbinates and the right and left ethmoidal cells with some crust formation in the ethmoidal

region on each side. The inferior turbinates were normal. There were no polypi. The posterior pharyngeal wall was glazed and dry. Tenacious mucopus was found in the nasopharynx. The larynx and teeth were normal. The tonsils were red, flat and submerged.

By transillumination the right and left frontal sinuses were dark, and the right and left maxillary sinuses transmitted some light, but were not perfectly clear.

The roentgen examination showed marked dulness of the right and left frontal sinuses; the right and left maxillary sinuses were hazy; the right and left ethmoidal cells were clear; the right and left sphenoidal sinuses were clear.

The results of the general physical examination were negative.

A diagnosis of chronic, right and left frontal sinusitis with pyosinus of the right and left maxillary sinuses was made.

I advised a modified Lothrop operation for the right and left sides in accordance with the technic previously described in this article. The operation was per-

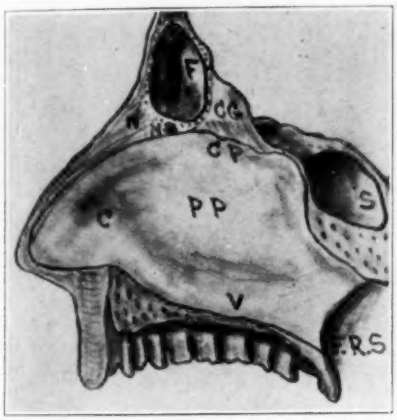

Figure 2

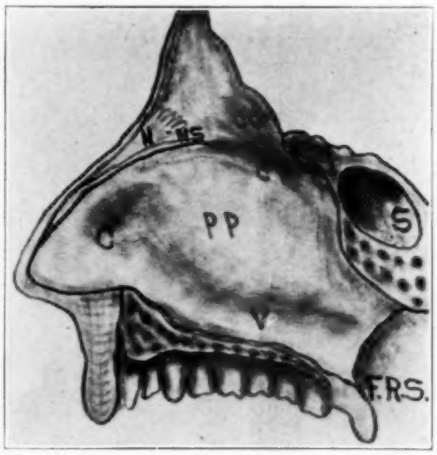

Figure 3

Fig. 2.—Frontal sinus with septum between the two frontal sinuses removed, but with nasal septum intact. *F* indicates frontal sinus; *N*, nasal bone; *N S*, nasal spine; *C G*, crista galli; *C P*, cribriform plate; *P P*, perpendicular plate of ethmoid; *C*, quadrangular cartilage; *V*, vomer; *S* sphenoidal sinus.

Fig. 3.—The septum between the frontal sinuses intact and nasal septum intact. *N* indicates nasal bone; *N S*, nasal spine; *C G*, crista galli; *C P*, cribriform plate; *P P*, perpendicular plate of ethmoid; *C*, quadrangular cartilage; *V*, vomer; *S*, sphenoidal sinus.

formed under ether anesthesia. The two incisions in the eyebrows were united across the midline in order better to expose the frontal bone. The anterior bony wall of each sinus was removed over an area approximately 2.5 cm. in diameter with Halle's electric burrs. Many polypi and granulations were removed with curets. Halle's electric burrs were used to enlarge the nasofrontal duct externally and anteriorly in order to avoid any injury to the cribriform plate. The bony septum between the two frontal sinuses and the nasal septum were left intact. A narrow gauze wick was passed from each sinus down into the nose. This was removed on the third day. The recovery was uneventful.

This patient was presented before the Colorado Otolaryngological Society on Feb. 3, 1923. He has been examined and reexamined many times since. He does not have any recurrences. He enjoys swimming and diving. I should have expected a reinfection long before this from his diving but so far he has remained well.

CASE 2.—Mr. B., aged 54, a farmer, first consulted me in March, 1921, complaining of severe pain in the left side of the forehead which had not been relieved by any treatment his physician had used. At times, for several months past, he had had profuse discharge from the left side of the nose which gave only temporary relief.

The examination showed an almost straight septum with pus in the left middle meatus. The floor of the left frontal sinus was tender to digital pressure. The posterior wall of the nasopharynx and pharynx was glazed. He wore complete dental plates. The tonsils were small, flat, submerged and fibroid. The larynx was normal.

Figure 4

Figure 5

Fig. 4.—Outer wall of nose following removal of anterior one third of middle turbinate. *F* indicates frontal sinus; *N*, nasal bone; *N S*, nasal spine; *Ag N*, agger nasi; *C G*, crista galli; *C P*, cribriform plate; *B*, bulla; *U*, unciform; *M T*, middle turbinate; *I T*, inferior turbinate; *S*, sphenoidal sinus.

Fig. 5.—Outer wall of nose following removal of floor of frontal sinus, nasal spine and agger nasi cells. *F* indicates frontal sinus; *C G*, crista galli; *B*, bulla; *U*, unciform; *M T*, middle turbinate; *I T*, inferior turbinate; *S*, sphenoidal sinus.

The results of the general physical examination were practically negative.

The roentgen examination showed a dull left frontal sinus, of large size, extending well up into the frontal bone. The anterior ethmoidal cells were cloudy on the left. All of the other sinuses were normal.

The left frontal sinus was dark by transillumination; the right frontal sinus was small, but clear. The right maxillary sinus was clear; the left, moderately clear.

A diagnosis of chronic, left frontal and left anterior ethmoidal sinusitis was made.

An intranasal operation was performed on the left side, under local anesthesia, in accordance with Mosher's technic, to exenterate the anterior ethmoidal cells and facilitate drainage through the nasofrontal duct. The anterior third of the left middle turbinate was removed. This last, however, failed to give much relief.

He returned in four weeks complaining of pain and inability to do his work on his farm. Because he came from a distance of several hundred miles and was anxious to have something more done to give him permanent relief, I performed

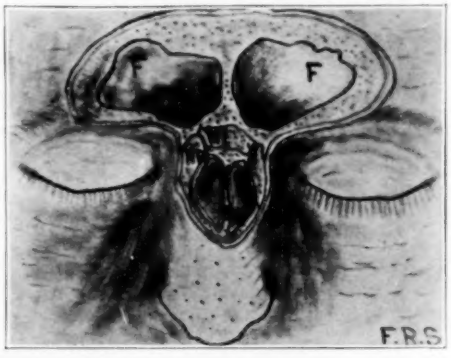

Fig. 6.—Frontal sinuses as seen from in front. *F* indicates frontal sinus; *N*, nasal bone; *N P*, nasal process of superior maxilla.

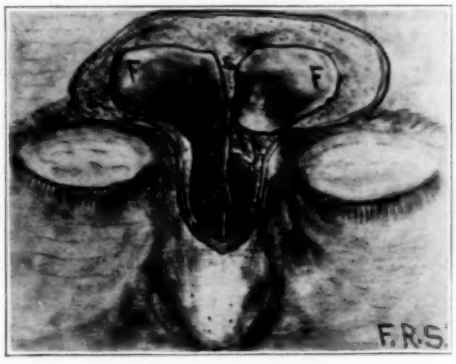

Fig. 7.—Anterior view following removal of floor of right frontal sinus. *F* indicates frontal sinus; *S*, septum.

a modification of the Lothrop operation on the left side under ether anesthesia in accordance with the technic previously described. The operation and his recovery were uneventful, except that he was exposed to bad weather following his return home. The drainage was not complete. Mild silver protein 10 per cent dropped into the left nostril three times a day gave relief.

The patient returned for observation in June, 1927. He has been free from symptoms except some crust formation in the left side of his nose below the naso-frontal duct. The scar is almost completely hidden by his eyebrow.

These two case reports illustrate the results obtained. I have performed ten or twelve of these operations in ten years. Not all of the patients are cured, but nearly all are relieved of the worst symptoms, such as pain and discharge.

In conclusion, the completed operation differs from Lothrop's in that: (1) the opposite sinus is not opened, (2) the upper part of the septum is not removed, (3) the opening into the sinus is all above the bridge, instead of below, and (4) the burrs are used from above instead of from below through the nose. These modifications give the technic greater usefulness, especially when only one frontal sinus requires operation; and a better view of the operative field is thus obtained.

Physicians' Building.

THE CHEMOTHERAPY AND SERUM THERAPY OF PNEUMOCOCCUS AND STREPTOCOCCUS MENINGITIS

VII. THE INTRACAROTID TREATMENT FOR EXPERIMENTAL PNEUMOCOCCUS MENINGITIS *

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WITH THE ASSISTANCE OF

ANNA M. RULE
AND
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PHILADELPHIA

The great difficulty and indeed the impossibility of bringing medicaments in contact with all of the meninges infected in severe septic meningitis by cerebral cisternal spinal lavage and medication, especially when the subarachnoid exudates have become plastic,[1] has led me to try the treatment for pneumococcus meningitis produced in dogs by injections of antipneumococcus agents into both common carotid arteries. Injections of dyes have shown an intense and widely distributed concentration of inoculum in the cerebral and basilar meninges, reaching as far as the upper end of the cord, with the passage of a portion into the cerebrospinal fluid.

Furthermore, the ease and safety with which Hirsch, Myerson and Halloran [2] and others have given intracarotid injections of neoarsphenamine and sulpharsphenamine in the treatment for paresis have shown that this route of medication might be used with safety in human beings if encouragement were found in the treatment for experimentally produced meningitis in dogs.

The results of numerous experiments briefly summarized in this paper have shown that: injections into the common carotid arteries can

* Submitted for publication, Jan. 12, 1929.

* From the Research Institute of Cutaneous Diseases of Philadelphia. Aided by the Tony Colket Memorial Fund for Investigation in Meningitis.

1. Kolmer, J. A.; Rule, A. M., and Madden, B.: The Chemotherapy and Serum Therapy of Pneumococcus and Streptococcus Meningitis: VI. The Cerebral-Cisternal-Spinal Lavage Method of Treatment for Septic Meningitis, Arch. Otolaryng. **9**:428 (April) 1929.

2. Hirsch, H. L.; Myerson, A., and Halloran, R. D.: Boston M. & S. J. **192**:713, 1925.

be given with practically no bleeding; the method is both simple and safe; the toxicity of drugs is no higher per kilogram of weight than by intravenous injection; intense concentration of the medicament occurs in the meninges, and encouraging results have been observed in the treatment for severe pneumococcus meningitis in dogs when the bilateral injections were combined with cisternal drainage and intracisternal medication.

RATIONALE OF INTRACAROTID MEDICATION

In pneumococcus and streptococcus meningitis the infection is of course on the surface of the meninges, and the organisms are probably best reached by antibacterial agents introduced directly into the cerebrospinal fluid. However, the intense staining of the cerebral and basilar meninges following the injection of dyes into either or both common carotid arteries, with staining of the cerebrospinal fluid obtained by cisternal puncture as well as the passage of serum from the meningeal arterioles into the fluid as detected by precipitin tests and especially during acute meningitis, has led me to surmise that by this route of injection it may be possible to influence favorably the course of diffuse pneumococcus and streptococcus meningitis. This hope has been especially entertained since the circulation of antibacterial agents introduced by spinal, cisternal and cerebral injection is sometimes limited in the presence of inflammatory exudates, whereas these do not interfere with their distribution by intra-arterial injection. Furthermore, the antibacterial agents are brought to the infected meninges in the maximum concentration, although only for a brief time. Injections into the internal carotid arteries are to be preferred, but the operative difficulties are considerable, so that injections into the common carotids has been used almost entirely even though a part of the inoculum is lost or wasted, as it were, through the external carotid arteries.

TOXICITY OF DRUGS BY INTRACAROTID INJECTION

By this route it was possible to try the effects of a wide variety of agents in the treatment for experimentally produced meningitis, including not only pneumococcus serum and antibody solution, but also ethylhydrocuprein hydrochloride (optochin) and other chemotherapeutic substances. It was surprising to note how well these substances were borne by this route of injection; indeed, almost as well as by intravenous injection when the various agents were slowly rather than rapidly administered. Occasionally, doses approaching the maximum tolerated amounts per kilogram of weight produced temporary symptoms and embarrassment of the respiratory center, but these were usually recovered from by the time the effects of ether had disappeared. In the presence of acute meningitis, dogs were occasionally lost through cardiac and respiratory failure during the course of intracarotid injections;

however, these accidents could be avoided by conducting cisternal drainage first and leaving the needle in place for the relief of cerebrospinal fluid during the intracarotid injections.

For determining the toxicity of substances, dogs weighing from 3 to 4 Kg. and rabbits from 1 to 2 Kg. were employed, and both carotid arteries were exposed with the animals under ether anesthesia. The solutions were injected by means of gage 22 needles, without ligation of the arteries and with surprisingly little bleeding; the following doses of various substances were well borne, not only after one injection, but likewise after two or three injections at daily intervals:

Gentian violet (Coleman and Bell)	0.5 cc. of 1:200	on each side
Neutral acriflavine	0.5 cc. of 1:100	on each side
Ethylhydrocuprein hydrochloride	0.5 cc. of 1:200	on each side
Diacetoxymercuri-4-nitro-2-cresol	0.5 cc. of 1:1,500	on each side
Sodium-oxymercury	0.5 cc. of 1:1,500	on each side
Formaldehyde	0.5 cc. of 1:100	on each side
Mercurochrome-220 soluble	0.5 cc. of 1:100	on each side
Pregl's solution	0.5 cc. undiluted	on each side

Saline solution, pneumococcus antibody solution, antipneumococcus serum and normal horse serum were injected in doses of from 5 to 20 cc. on each side with no immediate or late ill effects, except occasional temporary respiratory embarrassment in the case of the largest doses.

PRODUCTION OF PNEUMOCOCCUS MENINGITIS

Dogs of from 3 to 5 Kg. were infected in the usual manner by intracisternal or subdural injections of approximately 0.1 cc. of 1:60 dilutions of from six to twelve hour hormone broth cultures of type I pneumococcus per kilogram of bodyweight. Symptoms and signs of meningitis were usually apparent within twenty-four hours, with fever and leukocytosis, as shown in chart 1.

Dogs used as controls always succumbed within from five to seven days with the severe diffuse fibrinoplastic meningitis previously described,[3] the spinal and cisternal fluids being purulent and showing myriads of cocci in smears and cultures.

RESULTS IN THE TREATMENT FOR PNEUMOCOCCUS MENINGITIS[4]

Various plans or methods of treatment were instituted approximately from twenty-four to forty-eight hours after infection, at which time definite signs and symptoms of meningitis with fever and leukocytosis

3. Kolmer, J. A.: The Chemotherapy and Serum Therapy of Pneumococcus and Streptococcus Meningitis: I. A Résumé of the Present Status of the Treatment of Septic Meningitis, with Recommendation of Method, Arch. Otolaryng. **3**: 483 (June) 1926.

4. All inoculations and injections were conducted under ether anesthesia.

were present, as well as cloudy cisternal fluids. The methods and the results observed are briefly summarized as follows:

Intravenous Injections of Antibody Solution and Serum Alone, Combined with Cisternal Drainage and Treatment.—In the first place, it may be stated that the intravenous injections of both plain and concentrated pneumococcus antibody solutions alone in doses as high as 5 cc. per kilogram of body weight have had no influence on the course and duration of the meningitis. The same has been found true of type I antipneumococcus serum in confirmation of our earlier report,[3] the results being summarized in table 1.

Even when these injections were combined with cisternal drainage and intracisternal injections there were no constant or appreciable curative effects (table 2), so that I am confident that nothing worth while

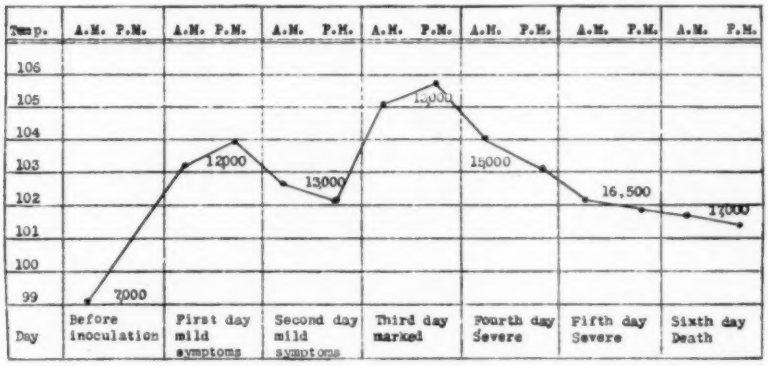

Chart 1.—The course of pneumococcus meningitis experimentally produced in the dog. The dogs were infected by the intracisternal injection of 0.1 cc. of seven hour hormone broth culture of type I pneumococcus. The numbers along the curve represent the total number of leukocytes per cubic millimeter of blood.

is to be expected from intravenous injections of antibody solution or pneumococcus serum in the treatment for pneumococcus meningitis, although their administration by this route may aid in combating the toxemia of the disease.

Intracarotid Injections of Pneumococcus Antibody Solution and Antipneumococcus Serum with Cisternal Drainage and Intracisternal Treatment.—Seven dogs were treated with intracarotid injections of plain and concentrated pneumococcus antibody solutions, with cisternal puncture and the drainage of cloudy cisternal fluids. Three dogs used as controls succumbed in from three to four days after inoculation. Two of the seven dogs treated recovered, and the lives of three additional animals were prolonged for from two to six days, the results being summarized in table 3.

Eight additional dogs were treated with intracarotid injections of plain and concentrated antibody solutions, with cisternal drainage and intracisternal injections of antibody solution. Among these there were five recoveries, and the lives of two additional animals were probably

TABLE 1.—*Intravenous Injections of Pneumococcus Antibody Solution and Serum in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Treatment per Kilogram	First Treatment After Infection	Number of Treatments	Survival, Days	Necropsy
5 cc. of plain antibody solution	24 hours	1	3	Severe meningitis
5 cc. of plain antibody solution	24 hours	1	3	Severe meningitis
2 cc. of plain antibody solution	24 hours	1	3	Severe meningitis
5 cc. of antipneumococcus serum	24 hours	1	3	Severe meningitis
Untreated control	—	—	3	Severe meningitis
Untreated control	—	—	3	Severe meningitis

* Infected by the subdural injection of 0.1 cc. of 1:60 dilution of six hour hormone broth culture per kilogram of body weight.

TABLE 2.—*Intravenous Injections of Pneumococcus Antibody Solution in Combination with Cisternal Drainage and Medication in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intravenous Dose per Kilogram	Intracisternal	Number of Treatments	Survival, Days	Necropsy
5 cc. plain	Drainage only	1	4	Severe meningitis
1.5 cc. concentrated	Drainage only	1	3	Severe meningitis
5 cc. plain	Drainage; 0.5 cc. of solution	1	4	Severe meningitis
5 cc. plain	Drainage; 0.5 cc. of solution	1	4	Severe meningitis
Untreated control	—	—	3	Severe meningitis
Untreated control	—	—	3	Severe meningitis

* Infected by the subdural or intracisternal injections of 0.1 cc. of 1:60 dilution of six hour broth culture per kilogram of body weight; treatment twenty-four hours later.

TABLE 3.—*Intracarotid Injections of Pneumococcus Antibody Solution Combined with Cisternal Drainage in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Number of Treatments	Survival, Days	Necropsy
Concentrated antibody solution; 1.5 cc.	1	10	Meninges clear; pus in ventricles
Concentrated antibody solution, 1.5 cc.	1	4	Meninges clear; pus in ventricles
Concentrated antibody solution; 1.5 cc.	1	Recovered	0
Concentrated antibody solution, 1.5 cc.	1	6	Severe meningitis
Plain antibody solution; 1 cc.	3	4	Severe meningitis
Plain antibody solution; 1 cc.	3	Recovered	0
Plain antibody solution; 1 cc.	2	8	Meninges clear; pus in ventricles
Untreated control	—	3	Severe meningitis
Untreated control	—	4	Severe meningitis
Untreated control	—	3	Severe meningitis

* Infected by intracisternal injections of 0.1 cc. of six hour broth culture per kilogram of body weight; first treatment about twenty-four hours later.

prolonged for from one to two days, the results being summarized in table 4.

Charts 2 and 3 show the temperature and leukocyte curves of two of the dogs that recovered; chart 4 shows the curves for an animal that

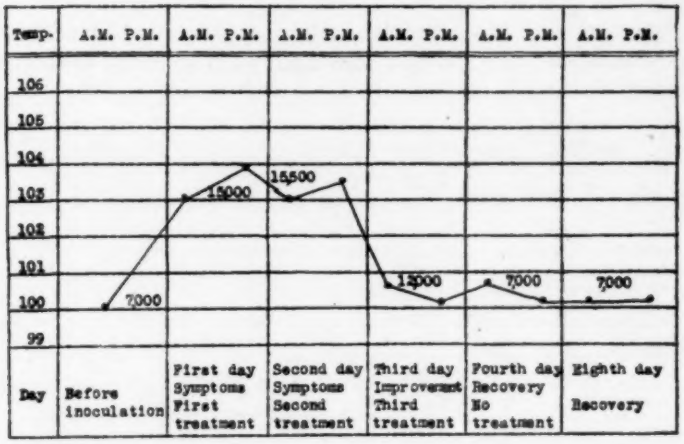

Chart 2.—The successful treatment for pneumococcus meningitis in the dog, with intracarotid and intracisternal injections of antibody solution. A dog (25B) was injected by the intracisternal injection of 0.1 cc. of 1:60 dilution of a seven hour broth culture. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of antibody solution (plain) per kilogram of body weight; intracisternal injection of 3 cc. of antibody solution.

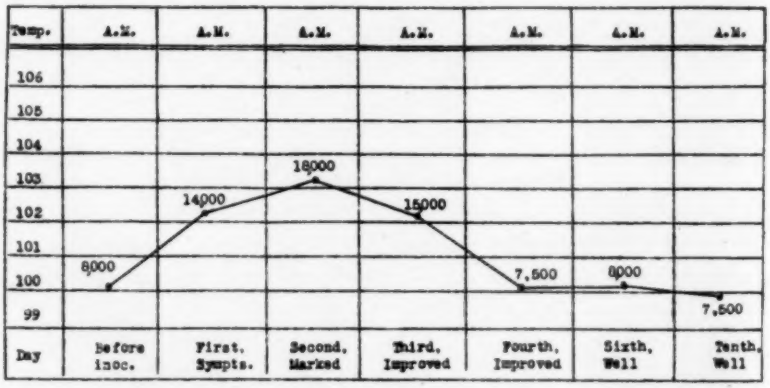

Chart 3.—The successful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antibody solution. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. The treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of antibody solution per kilogram of body weight, and the intracisternal injection of 3 cc. on the first, second and third days.

succumbed on the fourth day after injection; it is possible that pneumonia was a contributing factor to this unsuccessful result.

Similar results were observed with type I antipneumococcus serum (table 5). Two of three animals treated with cisternal drainage, intracarotid and intracisternal injections of serum recovered, and the life of the third animal was apparently prolonged by two days; both dogs

TABLE 4.—*Intracarotid Injections of Pneumococcus Antibody Solution Combined with Cisternal Drainage and Intracisternal Injections in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Intracisternal Dose per Dog, Cc.	Number of Treatments	Survival	Necropsy
Concentrated antibody solution; 2 cc...	1	1	5 days	Meninges clear; pus in ventricles
Concentrated antibody solution; 1.5 cc.	0.5	1	6 days	Severe meningitis
Plain antibody solution; 1 cc.....	3	3	Recovered	0
Plain antibody solution; 1 cc.....	3	3	Recovered	0
Plain antibody solution; 1 cc.....	3	3	Recovered	0
Plain antibody solution; 1 cc.....	3	2	4 days	Severe meningitis
Plain antibody solution; 1 cc.....	3	3	Recovered	0
Plain antibody solution; 1 cc.....	3	3	Recovered	0
Untreated control	—	—	36 hours	Severe meningitis
Untreated control	—	—	48 hours	Severe meningitis
Untreated control	—	—	3 days	Severe meningitis
Untreated control	—	—	4 days	Severe meningitis
Untreated control	—	—	3 days	Severe meningitis

* Infected by intracisternal injection of 0.1 cc. of six hour broth culture per kilogram of body weight; first treatment about twenty-four hours later.

TABLE 5.—*Intracarotid Injections of Type I Antipneumococcus Serum Combined with Cisternal Drainage and Intracisternal Injections in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Intracisternal Dose per Dog, Cc.	Number of Treatments	Survived	Necropsy
1 cc.	3	3	Recovered	0
1 cc.	3	2	6 days	Meninges clear; pus in ventricles
1 cc.	3	3	Recovered	0
Untreated control	—	—	3 days	Severe meningitis
Untreated control	—	—	4 days	Severe meningitis

* Infected by intracisternal injections of 0.1 cc. of 1:60 dilution of six hour broth culture per kilogram of body weight; first treatment about twenty-four hours later.

used as controls succumbed in from three to four days. Chart 5 shows the temperature and leukocyte curves for an animal that recovered.

Intracarotid Injections of a Mixture of Pneumococcus Antibody Solution and Ethylhydrocuprein Hydrochloride With and Without Intracisternal Injections.—Two dogs were given bilateral intracarotid injections of a mixture of antibody solution and ethylhydrocuprein hydrochloride (30 cc. of the former plus 1.5 cc. of 1:100 solution of the latter) as used in our former study for the treatment of animals with meningitis by cerebral cisternal spinal drainage and medication,[4] with cisternal drainage alone, but neither recovered, although the lives of both were apparently prolonged for from one to three days (chart 6). How-

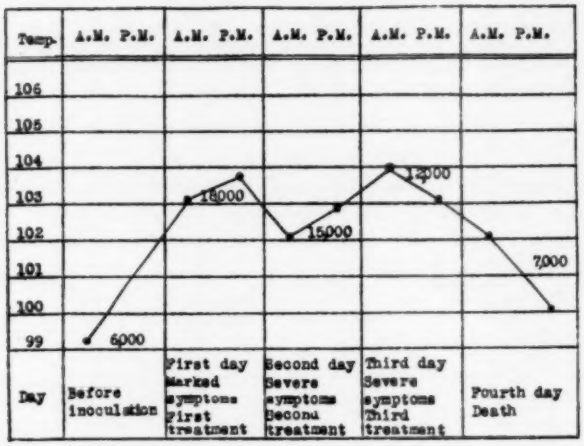

Chart 4.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antibody solution. A dog (28B) was infected by the intracisternal injection of 0.1 cc. of 1:60 dilution of six hour broth culture. The treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of antibody solution (plain) per kilogram of body weight; intracisternal injection of 2.5 cc. of antibody solution. Necropsy revealed moderately severe meningitis and early pneumonia; the blood was sterile.

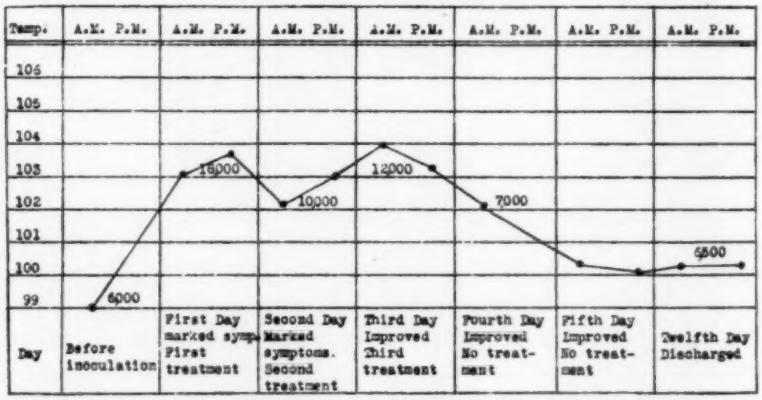

Chart 5.—The successful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antipneumococcus serum. A dog (31B) was infected by the intracisternal injection of 0.1 cc. of 1:60 dilution of six hour broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of type I serum per kilogram of body weight; 3 cc. of serum intracisternally.

ever, four of six additional animals that received intracarotid and intracisternal injections of the mixture recovered (charts 7 and 8), while both dogs used as controls succumbed in the usual period of from three to four days, as shown in table 6.

TABLE 6.—*Intracarotid Injections of Pneumococcus Antibody Solution and Ethylhydrocuprein Hydrochloride with and without Cisternal Injections in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Cisternal	Number of Treatments	Survival, Days	Necropsy
0.5 cc. of mixture†	Drainage only	1	5	Severe meningitis
0.5 cc. of mixture	Drainage only	2	8	Mild meningitis
0.5 cc. of mixture	Drainage; 9.5 cc. of mixture	3	Recovered	0
0.5 cc. of mixture	Drainage; 0.5 cc. of mixture	15	6	Mild meningitis
0.5 cc. of mixture	Drainage; 9.5 cc. of mixture	3	Recovered	0
0.5 cc. of mixture	Drainage; 0.5 cc. of mixture	3	3	Severe meningitis
0.5 cc. of mixture	Drainage; 0.5 cc. of mixture	3	Recovered	0
0.5 cc. of mixture	Drainage; 0.5 cc. of mixture	3	Recovered	0
Untreated control	—	0	3	Severe meningitis
Untreated control	—	0	4	Severe meningitis

* Infected by intracisternal injection of 0.1 cc. of 1:60 dilution of seven hour hormone broth cultures per kilogram of body weight; first treatment twenty-four hours later.
† 30 cc. of pneumococcus antibody solution with 1.5 cc. of a 1 per cent solution of ethylhydrocuprein hydrochloride.

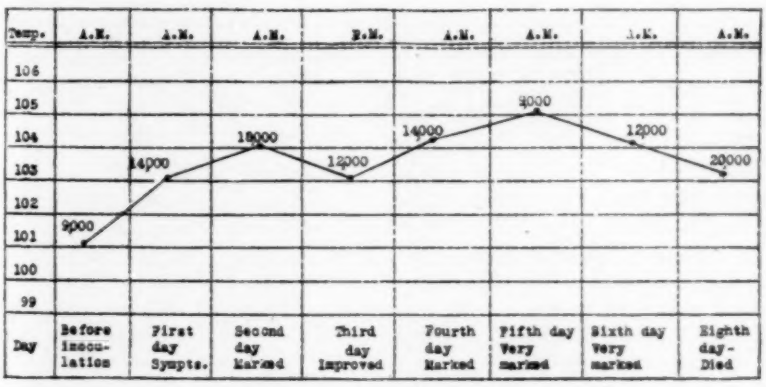

Chart 6.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antibody and ethylhydrocuprein hydrochloride mixtures. The dogs were infected by the injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of antibody and ethylhydrocuprein hydrochloride mixture per kilogram of body weight, and intracisternal injection of 0.5 cc. on the first, second and third days.

One of the animals that gave an unsuccessful result was apparently benefited by three of these combined treatments, and for several days we expected his complete recovery; but on the eighth day meningitis recurred,

evidently because of incomplete disinfection, death resulting on the fifteenth day, without additional treatment (chart 9). This was the only animal of our series that showed a recrudescence of infection, the animals either succumbing within from eight to ten days or living indefinitely.

Intracarotid Injections of Ethylhydrocuprein Hydrochloride with Cisternal Drainage and Treatment.—Intracarotid injections of ethylhydrocuprein hydrochloride alone did not give as good results (table 7). Five dogs received bilateral intracarotid injections of 0.5 cc. per kilogram of bodyweight of 1:500 to 1:1,000 solutions of the ethylhydrocuprein hydrochloride in saline; the cisterns were drained in all. Two received cisternal lavage with saline solution of sodium chloride and two with ethylhydrochloride of 1:1,000. However, one animal recovered,

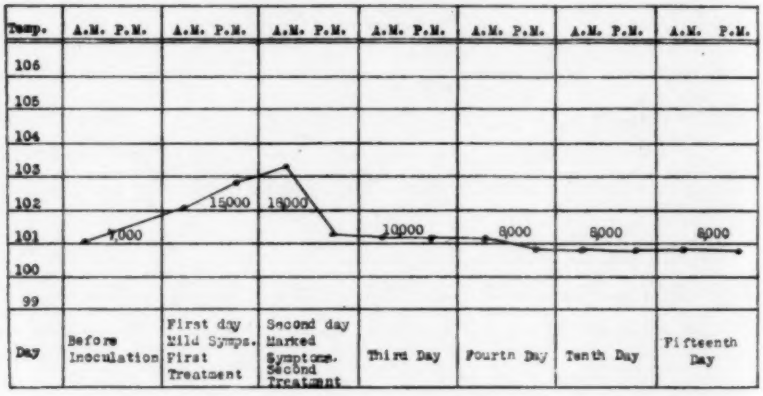

Chart 7.—The successful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antibody solution and ethylhydrocuprein hydrochloride mixture. The mixture was prepared by adding 1.5 cc. of 1:100 ethylhydrocuprein hydrochloride to 30 cc. of pneumococcus antibody solution. The dogs were infected by the intracisternal injection of 0.1 cc. of 1:60 dilution of a six hour broth culture per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of the mixture per kilogram of body weight.

being one of those that received the cisternal injection of ethylhydrocuprein hydrochloride in addition to the intracarotid injections; it would appear that the antibody solution alone is far more effective than ethylhydrocuprein hydrochloride alone in the treatment for experimentally produced pneumococcus meningitis, which was likewise our observation and conclusion in a former study.[3]

Intracarotid Injections of Gentian Violet with Cisternal Drainage.—In our former investigation [3] we found that intravenous, intraspinal and intracisternal injections of gentian violet were practically without effect

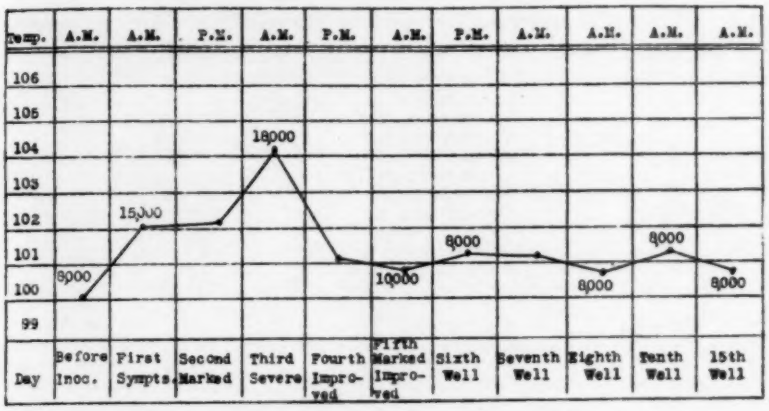

Chart 8.—The successful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of antibody and ethylhydrocuprein hydrochloride mixtures. The dogs were infected by the intracisternal injection of 0.1 cc. of ten hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 0.5 cc. of antibody and ethylhydrocuprein hydrochloride mixture per kilogram of body weight, and intracisternal injections of 0.5 cc. on the first, second and third days.

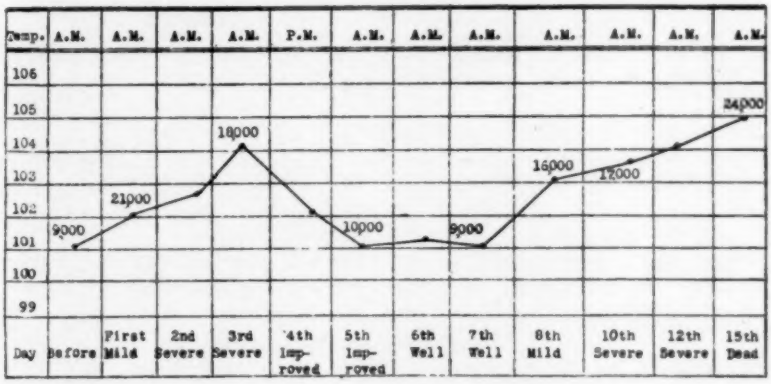

Chart 9.—A case of reinfection after treatment for pneumococcus meningitis experimentally produced in the dog. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of antibody and ethylhydrocuprein hydrochloride mixture per kilogram of body weight, and intracisternal injections of 0.5 cc. on the first, second and third days.

TABLE 7.—*Intracarotid Injections of Ethylhydrocuprein Hydrochloride with Cisternal Drainage and Treatment in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Cisternal	Number of Treatments	Survival, Days	Necropsy
0.5 cc. of 1:500	Drainage; 3 cc. of physiologic solution of sodium chloride	2	3	Severe meningitis
1 cc. of 1:1,000	Drainage; 3 cc. of physiologic solution of sodium chloride	1	2	Severe meningitis
1 cc. of 1:1,000	Drainage; 2 cc. of ethylhydrocuprein hydrochloride	2	Recovered	0
1 cc. of 1:1,000	Drainage, 2 cc. of ethylhydrocuprein hydrochloride	3	4	Severe meningitis
0.5 cc. of 1:300	Drainage only	1	4	Severe meningitis
Untreated control	—	—	3	Severe meningitis
Untreated control	—	—	3	Severe meningitis

* Infected by intracisternal injection of 0.1 cc. of 1:60 dilution of seven hour broth culture; first treatment about twenty-four hours later.

TABLE 8.—*Intracarotid Injections of Gentian Violet with Cisternal Drainage in the Treatment for Experimentally Produced Pneumococcus Meninigitis in Dogs* *

Intracarotid Dose per Kilogram on Each Side	Cisternal	Number of Treatments	Survival, Days	Necropsy
1 cc. of 1:1,000	Drainage; 3 cc. of physiologic solution of sodium chloride	1	2	Severe meningitis
1 cc. of 1:1,000	Drainage; 3 cc. of physiologic solution of sodium chloride	3	9	Severe meningitis
0.5 cc. of 1:200	Drainage only	1	Recovered	0
0.5 cc. of 1:200	Drainage only	1	2	Severe meningitis
0.5 cc. of 1:200	Drainage only	1	3	Severe meningitis
0.5 cc. of 1:200	Drainage only	1	3	Severe meningitis
Untreated control	—	—	4	Severe meningitis
Untreated control	—	—	2	Severe meningitis

* Infected by intracisternal injection of 0.1 cc. of 1:60 dilution of seven hour hormone broth culture per kilogram of body weight; treatment twenty-four hours later.

TABLE 9.—*Intracarotid Injection of Acriflavine, Sodium-Oxymercury, Diacetoxymercuri-4-Nitro-2-Cresol, Mercurochrome and Formaldehyde Combined with Cisternal Drainage in the Treatment for Experimentally Produced Pneumococcus Meningitis in Dogs* *

Compound	Intracarotid Dose per Kilogram on Each Side	Number of Treatments	Survival, Days	Necropsy
Acriflavine	0.5 cc. of 1:200	3	4	Severe meningitis
Sodium-oxymercury	0.5 cc. of 1:1,500	3	6	Mild meningitis
Diacetoxymercuri-4-nitro-2-cresol	0.5 cc. of 1:1,500	3	6	Mild meningitis
Mercurochrome	0.5 cc. of 1:200	3	4	Mild meningitis
Formaldehyde	0.5 cc. of 1:200	3	4	Severe meningitis
Pregl's solution	0.5 cc.	3	4	Severe meningitis
Untreated control	—	0	4	Severe meningitis
Untreated control	—	0	5	Severe meningitis

* Infected by intracisternal injection of 0.1 cc. of 1:60 dilution of twelve hour broth culture per kilogram of body weight; first treatment about twenty-four hours later.

in the treatment for experimentally produced pneumococcus meningitis in dogs; however, owing to the low toxicity, intense staining properties and high pneumococcidal activity (in vitro) of this dye, we considered it worth while to try intracarotid injections with cisternal drainage alone and with saline lavage.

Only one of six dogs recovered, while the life of a second was prolonged about five days (table 8); both dogs used as controls died in from two to four days.

Intracarotid Injections of Acriflavine, Sodium-Oxymercury, Diacetoxymercurie-4-Nitro-2-Cresol, Mercurochrome, Formaldehyde and Pregl's Solution with Cisternal Drainage.—Acriflavine administered by intracarotid injection yielded even less encouraging results, while sodium-oxymercury, diacetoxymercuri-4-nitro-2-cresol, mercurochrome, formal-

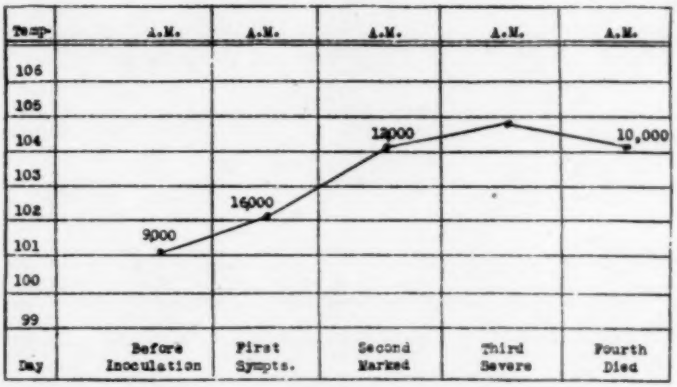

Chart 10.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid injections of mercurochrome and cisternal drainage. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 0.5 cc. of 1:200 mercurochrome per kilogram of body weight on the first, second and third days.

dehyde and Pregl's solution in the doses shown in table 9 and charts 10, 11 and 12 were without appreciable effects so far as the duration of the lives of the animals was concerned. Most of these substances when administered by intravenous, intracisternal and intraspinal injection were also found ineffective in our former investigation.[5]

5. Intraspinal and intracisternal injections of formaldehyde were not included, but subsequent experiments with this compound in a series of infected dogs yielded negative results. Intracisternal and intraspinal injections produced considerable irritation of the meninges with occasional fatal respiratory failures. Kolmer (footnote 3).

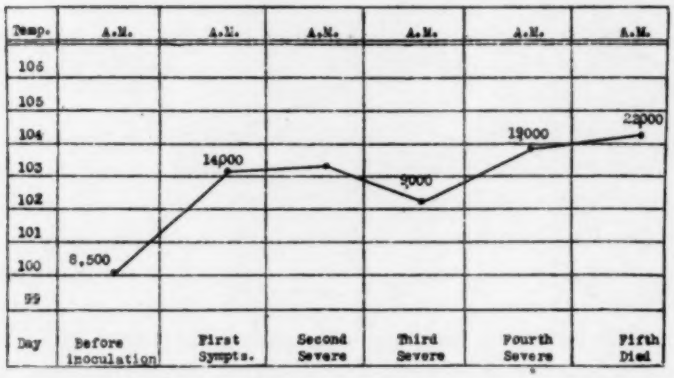

Chart 11.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid injections of sodium-oxymercury and cisternal drainage. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 0.5 cc. of 1:1,500 sodium-oxymercury per kilogram of body weight on the first, second and third days.

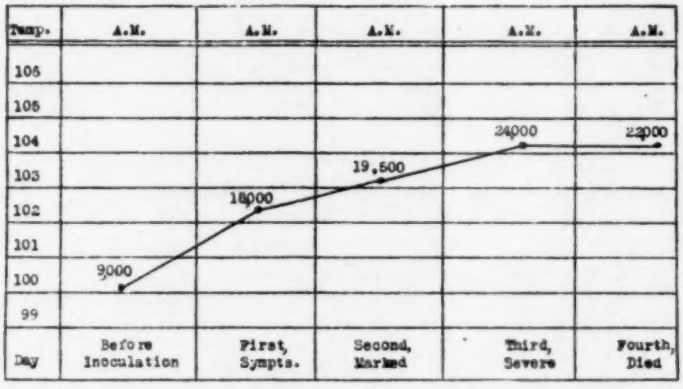

Chart 12.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid injections of diacetoxymercuri-4-nitro-2-cresol and cisternal drainage. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus. Treatment consisted in' cisternal drainage; bilateral intracarotid injections of 0.5 cc. of 1:1,500 diacetoxymercuri-4-nitro-2-cresol per kilogram of body weight on the first, second and third days.

SUMMARY AND PRACTICAL APPLICATIONS

The results of this investigation are summarized in table 10. It it evident that intravenous injections of pneumococcus antibody solution and antipneumococcus serum combined with cisternal drainage and lavage with saline solution were ineffective so far as permanent recoveries were concerned. The same has been found true of chemotherapeutic agents sometimes employed in the treatment for pneumococcus infections, as ethylhydrocuprein hydrochloride, gentian violet, acriflavine, sodium-oxymercury, diacetoxymercuric-4-nitro-2-cresol, mercurochrome, formaldehyde and Pregl's solution.

TABLE 10.—*Summary of Results in the Treatment for Pneumococcus Meningitis in Dogs*

Medicament	Route of Administration	Cisternal	Recoveries
Antibody solution	Intravenous	Drainage	None
Antipneumococcus serum	Intravenous	Drainage	None
Antibody solution	Intravenous	Drainage and lavage (physiologic solution of sodium chloride)	None
Antibody solution	Intracarotid	Drainage	30% (2 of 7)
Antibody solution	Intracarotid	Drainage and injection	62% (5 of 8)
Antipneumococcus serum	Intracarotid	Drainage and injection	66% (2 of 3)
Antibody-ethylhydrocuprein hydrochloride mixture	Intracarotid	Drainage	None
Antibody-ethylhydrocuprein hydrochloride mixture	Intracarotid	Drainage and injection	66% (4 of 6)
Ethylhydrocuprein hydrochloride	Intracarotid	Drainage	None
Ethylhydrocuprein hydrochloride	Intracarotid	Drainage and injection	50% (1 of 2)
Gentian violet	Intracarotid	Drainage	17% (1 of 6)
Acriflavine, sodium-oxymercury, diacetoxymercuri-4-nitro-2-cresol, mercurochrome, formaldehyde and Pregl's solution	Intracarotid	Drainage	None
None	—	Drainage and lavage (physiologic solution of sodium chloride)	None

Cisternal drainage and lavage with saline solution were likewise usually without life-saving qualities, although the duration of life was undoubtedly prolonged at times by these procedures; intracarotid and intracisternal injections of saline solution alone were ineffective (chart 13).

Intracarotid injections of antibody solution and serum, however, have definitely yielded more encouraging results than intravenous injections, especially when combined with drainage of the cisterna magna and intracisternal medication. Intracarotid injections of ethylhydrocuprein hydrochloride combined with cisternal drainage and medication have also yielded encouraging results while other substances, as gentian violet, acriflavine, sodium-oxymercury, diacetoxymercuric-4-nitro-2-cresol, formaldehyde and Pregl's solution were practically without effect.

It is apparent, therefore, that the antibody solution and serum were more effective, the best results probably being observed with mixtures either with ethylhydrocuprein hydrochloride as observed in a former study on cerebral cisternal spinal drainage.[1]

On the other hand, intracarotid injections alone have been but doubtfully effective, and it cannot be stated that any of the biologic and chemical agents employed were alone capable of sterilizing the meninges. Drainage from the cisterna magna and intracisternal medication was undoubtedly an important factor in the favorable results.

The method had not yet been tried in the treatment for pneumococcus meningitis in human beings; however, it is apparently worth trial in this disease of high mortality. My advice would be to use either pneumo-

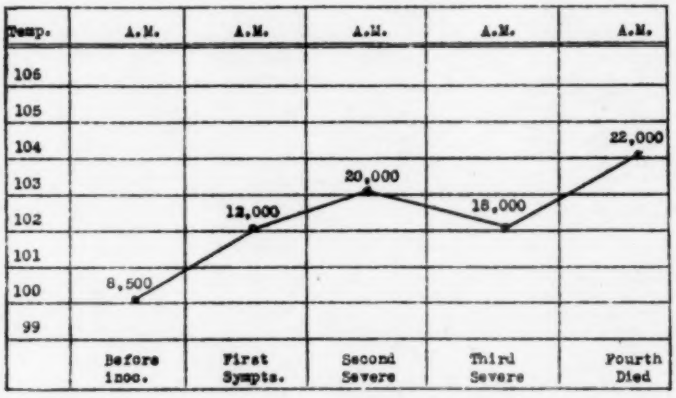

Chart 13.—The unsuccessful treatment for pneumococcus meningitis in the dog with intracarotid and intracisternal injections of physiologic solution of sodium chloride. The dog was infected by the intracisternal injection of 0.1 cc. of twelve hour hormone broth culture of type I pneumococcus per kilogram of body weight. Treatment consisted in: cisternal drainage; bilateral intracarotid injections of 1 cc. of physiologic solution of sodium chloride per kilogram of body weight, and 3 cc. intracisternally on the first, second and third days.

coccus antibody solution or polyvalent antipneumococcus serum to which is added 1 cc. of a 1:100 solution of ethylhydrocuprein hydrochloride to each 25 cc., and warmed to body temperature.

I doubt if success will be obtained in the treatment in late cases. All of our work with dogs was conducted with a type I pneumococcus; it is highly probable that the results would have been less encouraging with types II and III infections although the pneumococcus antibody solution with ethylhydrocuprein hydrochloride may be tried in these as well as in type IV infections with the hope that the solution contains specific antibodies for the infecting organisms.

Intracarotid injections in children are doubtless major surgical operations, but probably not more so than bilateral trephining and subarachnoid injections. It is sufficient to make injections into the common carotid arteries even though a portion of the inoculum is lost through the distribution of the external branches. Even though the meningitis begins on one side, it is necessary to make at least three daily injections into both carotid arteries. Hirsch, Myerson and Halloran [2] have described the following technic:

> The technique of injection of the common carotid artery without incising the skin is as follows: a needle is attached to a syringe containing the quantity of drug to be administered. The syringe is held in the hand like a writing pen, touching the skin almost perpendicularly, and not in the usual way when injecting intravenously. This position facilitates making a direct puncture and obviates the possibility of raising the outer coat of the artery. In this perpendicular position the needle has less chance of striking the internal jugular vein, which frequently overlaps the artery. The index and middle fingers of the left hand palpate the pulsation of the artery and the needle is directed toward the pulsation. The puncture is best made near the anterior edge of the sternomastoid muscle and near the upper border of the omohyoid, and just below the level of the upper border of the thyroid cartilage. Very frequently the external jugular vein crosses the edge of the sterno-mastoid muscle at the exact level, where it is most desirable to make the puncture. In that case it is preferable to go below this level rather than above, on account of the bifurcation of the common carotid which is generally one-half inch above the upper border of the thyroid cartilage. Occasionally it has been necessary to puncture the external jugular vein, and go through it in reaching the carotid artery, a matter of little consequence if gentle pressure is applied on withdrawal of the needle. When the needle reaches the level of the sheath of the large vessels, there is a definite resistance to further progress, even if the needle is very sharp. This resistance is discernible after a little practice and is of great value because at this moment, downward pressure must be stopped and the needle inserted into the artery by very gentle manipulation. Continued great pressure at this spot will flatten the artery because of the density of the sheath, and when the puncture is finally made the needle will cut through both the anterior and posterior walls of the artery. Though this has happened in our hands several times, no injury to the sympathic has been observed. Inclusion is then best effected by gently withdrawing the needle, and the injection is not begun until the blood is seen spurting into the syringe with each pulsation of the artery. The spurting of blood is also the index of proper inclusion of the needle on its downward course. The pulsating into the syringe is not visible if a needle of small caliber is used and as it is a very valuable indicator of the position of the needle, it is preferable to use one of fairly large caliber. It is our practice to use a 19, 20 or 21 gauge needle. Though the vagus nerve lies posterior to the artery and between it and the internal jugular vein, we have never observed evidence of even the slightest injury to it in any of our cases, and the literature records no injury.
>
> For all practical purposes, the procedure which is most feasible consists of the employment of the common carotid artery. Injections introduced into this artery will enter the internal carotid and it, being the larger branch, will probably receive the greater part of the injected substance; a much smaller amount going to the

external carotid, which is the smaller branch; and probably the results are but little affected by the small amount of the drug which is diverted through this branch.

From the experience gained from this investigation, I would advise the following order of procedure and dosage:

(*a*) Administration of ether anesthesia.

(*b*) Cisternal puncture and drainage; leave needle in position.

(*c*) The injection of 25 cc. of pneumococcus solution or antipneumococcus serum or mixture of either with 1 cc. of 1:100 ethylhydrocuprein hydrochloride into each common carotid artery.

(*d*) The intracisternal injection of 5 cc. of antibody solution or serum or of the mixture followed by withdrawal of the needle.

The doses advised are for adults and children over 12 years of age; younger children may receive about one-half the quantities mentioned.

The importance of early treatment is to be emphasized. It is highly probable that treatments will be required at daily intervals for three or more days, according to the conditions present.

CONCLUSIONS

1. The toxicity of pneumococcus antibody solution, antipneumococcus serum, ethylrydrocuprein hydrochloride, gentian violet, acriflavine, sodium oxymercury, diacetoxymercuri-4-nitro-2-cresol, formaldehyde and Pregl's solution by injection into the common carotid arteries was approximately the same as by intravenous injection.

2. Intravenous injections of pneumococcus antibody solution and of antipneumococcus serum were ineffective in the treatment for type I pneumococcus meningitis experimentally produced in dogs.

3. Cisternal drainage and lavage alone were generally ineffective in the treatment for this type of meningitis.

4. Injections of pneumococcus antibody solution or type I antipneumococcus serum into each common carotid artery combined with cisternal drainage and intracisternal medication yielded from 30 to 66 per cent permanent recoveries in the treatment for a fatal type I pneumococcus meningitis in dogs.

5. Injections of mixtures of pneumococcus antibody solution or type I serum with ethylhydrocuprein hydrochloride into each common carotid artery combined with drainage of the cisterna magna and the intracisternal injection of the mixtures yielded approximately 66 per cent permanent recoveries in the treatment for pneumococcus meningitis in dogs.

6. Intracarotid injections of antibody solution and antipneumococcus serum alone without cisternal drainage were practically ineffective.

7. Intracarotid combined with intracisternal injections of ethylhydrocuprein hydrochloride and gentian violet resulted in some recoveries; sodium-oxymercury, diacetoxymercuri-4-nitro-2-cresol, mercurochrome, formaldehyde and Pregl's solution were ineffective.

8. A method is outlined for the treatment for pneumococcus meningitis in human beings, consisting of cisternal drainage, bilateral intracarotid (common) injections of mixtures of antibody solution or serum with ethylhydrocuprein hydrochloride combined with intracisternal injections of these solutions.

We are indebted to the Mulford Laboratories of Philadelphia for generous supplies of both plain and concentrated pneumococcus antibody solution (Huntoon) for these experiments; also for supplies of antipneumococcus serum.

TONSILLECTOMY

MODIFIED AND ORIGINAL TECHNIC *

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The removal of the faucial tonsils has become one of the most commonplace operations in the realm of surgery, and the methods of procedure are as numerous as the physicians who attempt the operation. This is a lamentable fact for all concerned, especially for the patient. The end-results accurately reflect the degree of skill, experience and surgical judgment of the operator. Though each may have some points of technic peculiar to himself that may often be used advantageously by another, the fact remains, as in all surgical operations, that only by study and observation of the modus operandi of skilled and experienced laryngologists can the wheat be sifted from the chaff. Only then are laryngologists able to correlate their own ideas and skill with the best methods to be used in their daily work. They must ever bear in mind that they are dealing with anatomic structures the functions of which are most delicate and complicated, and that the utmost care is required during an operation to preserve, as far as possible, their normal relationships.

ANESTHETIC

I am confident that a great many deaths reported each year by physicians performing operations on the nose and throat are due to the excessive doses of one, or of more than one, anesthetic used in the same case. Dr. Emil Mayer,[1] chairman of the Committee for the Study of Toxic Effects of Local Anesthetics of the American Medical Association, revealed in his report of fatalities from local anesthetics the almost uniform high concentration and the multiplicity of anesthetics used. More than one local anesthetic should never be used in a given case unless it is absolutely necessary. If the throat must be swabbed with a cocaine solution to abolish the superficial reflexes, one should use a solution not stronger than 4 per cent and lightly should paint only the surface of the pharynx, care being taken that the solution is not swallowed. It has been my experience that the complete abolition of the superficial pharyngeal reflexes is rarely necessary. If they are not entirely abolished, blood and infected material will not enter the larynx and trachea, with attending complications. Abscess of the lung occurs less frequently after a local than after a general anesthetic, notwith-

* Submitted for publication, Feb. 2, 1929.

1. Mayer, Emil: Fatalities from Local Anesthetics, J. A. M. A. **90**:1290 (April 21) 1928.

standing the various avenues of infection enumerated by many observers. In children under 12 or 14 years of age a general anesthetic must be used for obvious reasons.

A local anesthetic is preferable for all adults except those with hypersensitive throats or a high degree of nervous instability, and in a large percentage of these cases the anesthesia can be fully controlled by proper preliminary narcosis. The desired narcosis can usually be obtained by the hypodermic administration of ¼ grain (16 mg.) of morphine with $\frac{1}{150}$ grain (0.4 mg.) of scopalamine, the dosage varying according to body weight, from one half to one hour before operation. This procedure eliminates the local reflexes to a great extent and in most cases allays all fear and apprehension, so that the operation can be performed satisfactorily. With the patient in the upright posture, the operator has the advantage of having the anatomic parts in their natural relative position and of obtaining the cooperation of the patient, which is most desirable. The solution injected is composed of a 1 per cent solution of procaine hydrochloride and a solution of epinephrine hydrochloride in a concentration of 1 : 10,000 in ampules containing 6 cc. One ampule for a patient is usually all that is needed—3 cc. for each tonsil.

INJECTION OF THE ANESTHETIC

Years of experience and observation have proved to me that the submucous peritonsillar infiltration is the most efficient and certainly the safest method. The needle should not transfix the tonsil because of the danger of carrying micro-organisms constantly resident there into the deeper structures of the pharyngeal wall, thereby producing a cervical cellulitis which often proves fatal. Another objection to the deep injection of a foreign substance, especially in large amounts, is the trauma which produces a prolonged and painful reaction and convalescence. Nerve blocking is open to the same objections, and in addition, I feel, is unnecessary for satisfactory anesthesia. The extracapsular injection, i.e., injection of the solution into the space between the so-called capsule of the tonsil and the aponeurosis of the constrictor muscles, is not advantageous and in most instances is impossible to accomplish. The anesthesia is almost always complete, and the operation is performed with little or no pain.

OPERATION

The purpose should always be primarily to give the patient the benefit of a complete operation regardless of the size, shape and position of the gland. Since no two persons have tonsils exactly alike, it is impossible to use a standardized ring instrument in all cases. Sluder claims that with his own instrument he can remove more than 98 per

cent of all tonsils. If he can do this, I am sure that he is the only operator using his instrument who can even approximate his claim. The Sluder technic suggested the underlying principles governing the use and construction of practically all ring instruments. The method of using a ring instrument seems and looks simple, but it is most technical in its practical application. The age of the patient is a factor in determining the kind of operation to be done. Tonsillectomy in adults with either a general or a local anesthetic at once suggests the method of dissection and snare. I feel that a ring instrument of any design has a limited field of usefulness in this class of work, for the reasons already mentioned. A few years ago, Shurly [2] of Detroit in a comprehensive paper based on a wide experience, said that the methods of choice in all cases of tonsil enucleation were the Sluder instruments, when practical, and dissection and snare. I am becoming more and more convinced that there is really only one method which is strictly surgical and practical in all cases, that is, the use of dissection and snare. Dissection is simple in simple cases, and it can be readily adapted to any size, shape, position and condition of the gland. This method is essential in fibrosed, adherent and fan-shaped tonsils in which the margins extend peripherally and fade or blend into the mucous membrane covering the pillars. In short, there is no known anatomic condition that cannot be satisfactorily met by careful use of the dissection and snare method.

The dissection should be accomplished with as little trauma as possible. Bands of adhesion should be cut, not torn with great force by blunt dissection. The mucous membrane should be separated from its attachment to the surface of the tonsil with a sharp concave knife, care being taken to preserve as far as possible the mucous membrane to provide a normal covering for the anterior and posterior pillars. The dissection can then be carried laterally to the floor of the tonsillar fossa by the careful use of a pair of Lillie's tonsil scissors introduced closed, either side of the blades being used for blunt dissection. The blades introduced closed may be opened, the dull edges being used by reverse scissors motion for blunt dissection; a considerable degree of separation of the tonsil from its fossa is thus accomplished, and the fibers of the aponeurosis of the constrictor muscles are thereby brought into view. At this juncture, the anterior and posterior pillars should be separated from the gland from above downward. An effort should then be made to deliver from the fossa the upper pole of the tonsil, leaving on the upper and outer surface a fan-shaped attachment which contains the blood supply entering from above; this attachment should be clamped with a properly curved forceps before it is cut proximal to the forceps. The descending palatine artery enters the tonsil at this point; if it is clamped before it is cut, a sheet of blood will be prevented from flowing down and obscuring the field of operation. The dissection is continued downward to a level corresponding to the base of the tongue; the snare may then be thrown over the free upper two thirds of the tonsil and passed

2. Shurly, Burt R.: The Removal of Tonsils, J. A. M. A. **81**:800 (Sept. 8) 1923.

well down to engage the lower pole, thus effecting its complete enucleation. If the clamp is still on the descending palatine artery, it should be ligated with catgut and the clamp removed. If the clamp engages too much tissue, it must be released; if bleeding ensues, the artery should be grasped by a suitable forceps and ligated. Dr. A. G. Farmer, my associate, and I have placed a ligating forceps on the market which bears our name, and which fills this need, I believe, quite satisfactorily.

The control of hemorrhage is important in all operations on the tonsils. It is absolutely essential in the strictly surgical procedure of dissection and snare. When a blood vessel is cut with a sharp instrument, it is necessary to tie it with a ligature to prevent bleeding. Laryngologists have been slow to conform to the basic principles of the general surgeon, that is, the achievement of complete hemostasis as he proceeds with the operation. I believe that this tendency has been due principally to the extreme difficulty in attempting to tie a bleeding vessel in such an inaccessible place as a tonsillar fossa. But this should not prevent the operator from giving the patient the benefit of a complete operation, and a little persistent effort and practice will enable him to tie these vessels easily and successfully. It is incumbent on the operator to perfect his technic to meet this situation. I worked with this problem—and it was a real one—for several years while I was learning to ligate the vessels rather than abandon what I considered a fundamentally sound surgical operation.

COMPLETE REMOVAL

From a clinical standpoint, it is the duty of the laryngologist to remove if possible all of the tonsillar tissue. If a portion of the gland is permitted to remain in situ, a potential focus of infection is perpetuated, and the clinical condition for which the operation was performed continues. Textbooks refer to the inclusion membrane of the tonsil as a capsule. Poynter,[3] in 1921, stated:

We are accustomed to speak of a tonsillar capsule, but it is rather difficult to demonstrate this as a definite morphologic entity. In the earlier development the lymphoid masses form in the areolar tissue between the mucous membrane of the pharynx and the surrounding muscles. Later there is more or less condensation of this tissue outside of the masses and between them, so that we have a sheet of connective tissue outside of the tonsil and running through the tonsil at various points. It does not seem that there is ever a very great condensation at the upper pole, so that one may say that the upper half to two-thirds of the tonsil rests in a bed of loose areolar tissue which separates it to a considerable extent from the muscle. When the tonsil is dissected out, this tissue falls into a plane and has the appearance of a definite sheath, but from examination of carefully prepared microscopic sections of the organ I cannot discover thickened or condensed plane of tissue.

3. Poynter, C. W. M.: Observations on the Palatine Tonsil, Tr. Am. Acad. Ophth. Oto-Laryng., 1921, p. 306.

His conclusions are emphasized by my clinical and surgical experience, in which the extrusion of bits of tonsillar tissue followed what I thought had been a complete operation. The alternating anatomic relationship of circular bands of muscle fibers of the middle and inferior constrictor muscles of the pharynx and of lymphoid or tonsillar tissue of the lower pole of the tonsil has been clearly demonstrated by anatomists. This condition requires the utmost care in a tonsillectomy to insure the removal of as much of the lymphoid tissue as possible. This is the only point in the tonsillar fossa in which one is often justified in removing some bands of muscle fiber because of the lymphoid inclusions between them.

NONSURGICAL SUBSTITUTIONS

Electric coagulation, electric needles, electrodesiccation, the radio knife, etc., ad infinitum, have a limited field of practical use. They should be used only pending a favorable time for complete operation. Some laryngologists previously enjoying a favorable reputation have succumbed to the appeal of unscientific claims of the manufacturers of electrical apparatus and have proclaimed to the public through front page newspaper articles the wonderful virtues of the new operations. That as time goes on some of these electrical substitutions will find a limited place in the field of otolaryngology is not to be doubted, but it will be a slow process and will have to be supported by sound clinical evidence. To my mind, at the present time there is no substitute for a complete tonsillectomy performed in a strictly surgical way.

CONCLUSIONS

1. Refinements in operative technic may be obtained by study and observation of the work of skilled and experienced laryngologists.

2. Operators should avoid as far as possible the injection and local application of excessive doses of several anesthetic solutions. Abolition of the superficial pharyngeal reflexes is rarely necessary. In adults, a local is preferable to a general anesthetic.

3. The submucous peritonsillar infiltration is sufficient for good anesthesia and is without the danger of initiating a cervical cellulitis following deep injection, especially if the needle transfixes the infected tonsils.

4. Ring instruments are suitable in only a selected number of cases. The use of dissection and snare is practical in all cases, especially for adults.

5. The descending palatine artery may be dissected, clamped and severed proximal to the forceps, thus preventing the flow of blood from above during the completion of the operation. All blood vessels should be ligated with catgut by the aid of a suitable forceps.

6. The general clinical condition is not benefited if a portion of the tonsil is permitted to remain in situ. In the absence of a complete capsule and owing to the tongue and groove relationship of muscle fibers and tonsillar tissue at the lower pole, the performance of a complete operation is often difficult.

7. One should be cautious in accepting the relative merits of many of the electrosubstitutions, because their field of usefulness is limited at the present time. One must not forget that when a piece of tonsil remains—whether it has been partially cooked by an electric apparatus or left after a tonsillectomy—it is just as much a potential source of systemic infection as though no part of the tonsil had been removed.

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FACIAL ERYSIPELAS FOLLOWING TONSILLECTOMY

REPORT OF A CASE *

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Erysipelas is an acute, infectious, contagious disease, manifesting itself by characteristic inflammation of the skin and mucous membranes. It has always been my impression that this condition is essentially a disease of the skin, accompanied by marked constitutional symptoms, and that its occurrence about an open wound in any part of the body means infection by the streptococcus.

Spohn [1] stated the belief that nine of every ten cases belong to the group of so-called idiopathic cases of erysipelas of the face, with a probable starting point in fissures at the entrance to the nares or in abrasions of the nasal mucous membrane. Janson [2] stated that facial erysipelas usually begins on the nose and in fissures about the entrance of the nares. He pointed out that two symptoms which are frequently overlooked but which apparently often usher in facial erysipelas are "nasal catarrh and inflammation of the pharynx." He declared that the streptococcus which normally inhabits the pharynx can cause facial erysipelas with or without angina or coryza as a primary cause. He suggested that the infection usually develops in the nasopharynx. Holmes [3] stated that cases of erysipelas of the pharyngeal mucosa are rare and that when they do occur they have considerable significance since facial involvement may develop secondarily. Roger [4] stated: "Classic authors consider erysipelatous angina as very frequent. Our observations on this point do not accord with this opinion." He attributed the sore throat in reality to a painful swelling of the cervical nodes.

A case has been reported by Luc [5] in which the left antrum became infected during an attack of facial erysipelas. The erysipelas subsided. Nine months later the antrum was operated on, and the operation was followed promptly by facial erysipelas which first appeared about the

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* From the Oto-rhino-laryngologic service of Bellevue Hospital.

1. Spohn, G. W.: Detroit M. J. **4**:361, 1904.

2. Janson, C.: För. v. Första Nord. Kongr. **1**:63 (Aug.) 1896.

3. Holmes, C. R.: Etiology of Erysipelas, Ann. Otol. Rhin. & Laryng., September, 1907, vol. 16.

4. Roger, H.: Contribution à l'étude clinique de l'érysipèle, Rev. méd., Paris **15**:900, 1895; **16**:192, 1896.

5. Luc: Un cas d'empyéme de l'antre d'Highmore dû au Streptocoque de l'érysipéle, La France méd., May 15, 1891, no. 20.

left nostril. Welty [6] reported many cases of facial erysipelas due to pathologic conditions in the nose and accessory sinuses. He stated that 60 per cent of cases with facial erysipelas showed pus in the nose. Hall and Tilly [7] stated the belief that the pharyngeal tonsil has been the starting point of many cases of facial erysipelas. Lavrand [8] reported a case of facial erysipelas in a boy, aged 15. There were repeated outbreaks of the infection, frequently two or three a month, each outbreak being preceded by a cold in the head. The lesion always appeared first at the punctum of the tear duct. Treatment of the nasopharynx and nose reduced the frequency and virulence of the attacks. Lavrand considered the tonsil of Luschka as the starting point in this case. He also reported a case in which the removal of adenoid tissue prevented a recurrence of erysipelas which previously had manifested itself frequently. Shiffers [9] stated that nasal erysipelas is continuous with erysipelas of the skin and vice versa. He pointed out the importance of epistaxis as a prodromal symptom of nasal or pharyngeal erysipelas.

Fauveau,[10] in his thesis for the doctorate in Bordeaux, said: "In medical (idiopathic) erysipelas, the port of entry of the contagion frequently passes unperceived when the site of the disease is on the face, because it is hidden in the natural cavities such as the mouth, the pharynx, the external auditory canal or the nasal fossae."

Gerhardt [11] stated that "in erysipelas with prodromal fever, as occurred twenty-eight times in sixty-nine cases there is frequently an antecedent affection of the throat."

Holmes reported a case in which a patient following tonsillectomy visited another patient who had erysipelas. He promptly developed erysipelas of the nasopharynx which spread through the eustachian tube into the middle ear, the external canal, the auricle and the face.

Zarniko [12] stated that "erysipelas of the mucous membrane of the nose either begins in the pharynx, extends through the nose and then spreads over the face, or it progresses in the opposite direction."

Duroziez [13] reported a case of a woman, aged 30, who entered the hospital complaining of difficulty in swallowing and pain in the chest,

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6. Welty, C. F.: Acute and Chronic Suppurations of the Ear and Nose the Direct Cause of Facial Erysipelas, J. A. M. A. **47**:2052 (Dec. 22) 1906.

7. Hall and Tilly: Diseases of the Nose and Throat, London, P. Blakiston's Son & Company, 1901, p. 355.

8. Lavrand: L'oedème chronique des paupières consécutif à des érysipèles faciaux à répétition d'origine pharyngée, Rev. de laryngol. **9**:378, 1889.

9. Shiffers: De l'érysipèle des fosses nasales, Rev. de laryngol. **9**:113, 1899.

10. Fauveau, quoted by Holmes (footnote 3).

11. Gerhardt: Berl. klin. Wchnschr. **3**:45, 1887.

12. Zarniko: Die Krankheiten der Nase, ihre Nebenhohlen und des Nasen Rachenraumes, Berlin, S. Karger, 1894, p. 166 and p. 472.

13. Duroziez, quoted by Holmes (footnote 3).

with symptoms of pharyngitis and inflammation of the upper air passages. After admission, she developed fever and delirium. Nine days later, facial erysipelas began at the nose.

Wurdemann [14] reported a case of a woman, aged 25, with facial erysipelas beginning at the right nostril and spreading over the face. The nasal passages were swollen, and the pharynx was reddened. Soreness of the throat had been present for several months.

Joss [15] reported a case of a primipara, aged 33, who complained of pain and a sensation of tension in the nose on the day of delivery. She had had nasopharyngeal catarrh during the last days of her pregnancy. Two days after delivery, facial erysipelas developed.

In the case which I report, there existed a definite starting point for the infection in the region of the fossa following the removal of the faucial tonsil. The active signs of the infection were preceded by a hemorrhage which appeared several hours after the operation, and promptly subsided, followed by excruciating pain out of proportion to the trauma produced by the operation. Later there was a sharp rise in temperature, accompanied by chills and the appearance of a small cluster of blebs at a point in the operative field. These symptoms, together with the rapid spread of the condition, which confined itself to the mucous membranes of one side of the throat, did not involve deeper structures, came forward into the same side of the nose, accompanied by epistaxis, and later burst out on the face from the vestibule of the nose as an active, acute infection of the skin, formed an unusual clinical picture.

REPORT OF CASE

On May 1, 1924, N. P., a man, aged 28, a clerk, complained of repeated attacks of tonsillitis. He had just recovered from an attack. The patient did not present a history of any severe illness or of erysipelas. Examination disclosed a fairly pronounced congestion and swelling of both tonsils. There were many crypts from which a semifluid purulent material was expressed.

On May 16, all signs of acute inflammation having subsided, tonsillectomy was performed by dissection and snare; 7 cc. of a freshly boiled 1 per cent solution of procaine hydrochloride and 5 minims (0.30 cc.) of epinephrine chloride (1:1,000) were used for anesthesia. The fauces and soft palate were not painted with cocaine prior to injection of the procaine hydrochloride. Three injections of the solution of procaine hydrochloride were made on each side: the first, posterior and mesial to the last upper molar tooth; the second, through the anterior pillar at about the middle and lateral to the tonsil, and the third, just above the point where the anterior pillar joins the tongue, also lateral to the tonsil. The injections were started on the right side, 1 cc. being injected at each point. No difficulties were encountered during the operation, little trauma was inflicted, and there was no more than the usual amount of oozing at the surface. Twelve hours later there was a

14. Wurdemann, H. V.: Erysipelas and Acute Suppuration of the Middle Ear, M. News **59**:595, 1891.

15. Joss: Cor.-Bl. f. schweizer. Aerzte **31**:617, 1901.

moderate hemorrhage from the right tonsillar fossa. A clot was removed with a sponge forceps, and a string sponge was placed in the fossa for a half hour. This completely controlled the bleeding so that no other procedure was necessary.

On May 18, two days after the operation, the patient had a chill which was followed by a rise in temperature to 103 F. The right side of the throat had become so painful that the patient was unable to swallow. When the tongue was depressed, he complained of severe pain in the right tonsillar fossa. It was only with the greatest difficulty that the tongue could be controlled sufficiently to see the fauces. The right anterior and posterior pillars were more edematous than the left and were a deep purplish red. A thick gray slough was found on the surface of the right fossa. The left pillars and fossa had the appearance usually observed after tonsillectomy. On the right side, at the site of the first injection of procaine hydrochloride, had appeared a white spot, in the center of which was a bleb. The ears and nose were normal.

On the following day, the temperature ranged between 101 to 103.6 F. On the right side of the soft palate there were several blebs surrounding the first one. The mucous membrane in the immediate vicinity of the blebs was an angry purple in color and was extremely edematous. It was impossible to examine the nasopharynx because of tenderness. Examination disclosed that the ears remained normal.

Twenty-four hours later, there was a large cluster of blebs running backward and downward to the free margin of the soft palate. The temperature ranged from 101 to 104 F. The mucous membrane of the nasopharynx resembled the soft palate in color, but, in addition, it had a granular area which extended far forward toward the right choana. The ears were normal, except for a moderate retraction of the right membrana tympani. A tentative diagnosis of erysipelas was made at this time, chiefly because of the marked constitutional symptoms.

On May 24, the patient said his throat felt somewhat better. Blebs were not visible on the soft palate. There was pain and soreness in the right side of the nose, however, and two severe epistaxes had occurred. The temperature was still elevated, and the patient was mildly delirious. The right side of the nose from the ala nasi nearly to the bridge was swollen, and there was redness just below the ala. Examination disclosed edema, considerable serous secretion, and crusting in the right side of the nose. The patient complained of a feeling of fulness there. Every time he blew his nose, a considerable amount of blood serum was ejected.

On the following day, the area of redness had spread over the ala on the right side, and there were a few small blebs about it. The margin of the reddened area was raised and well defined, atypical symptom of erysipelas.

During the next four days, the area enlarged until, on May 28, it covered the entire right side of the face below the eye, extending back into the scalp to about 1 inch posterior to the right auricle, which was also involved. The disease did not extend to the neck except for a small area posterior and inferior to the auricle.

On June 4 the temperature of the patient became normal, and the disease began to subside. Convalescence was slow, but there was complete recovery.

TWO-STAGE THYROTOMY IN CASES CONSIDERED BAD RISKS *

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One of the fundamental principles of present day surgery is the conservation of the patient's strength. This is particularly true of the patient who presents a bad risk. The operative mortality in thyrotomy for epithelioma of the larynx is extremely low, and when death does occur, the patient usually presented a bad surgical risk, either because of advanced age or disease. It is in these cases of bad surgical risk that I believe two-stage thyrotomy is indicated; the patient receives less postoperative reaction than in the one-stage operation.

In 1922, Jackson [1] reported forty-five cases in which thyrotomy was done without operative deaths. Thomson [2] reported an operative mortality rate of 4 per cent in seventy cases in which laryngofissure was performed. He said, however, that laryngofissure is much more frequently fatal than complete laryngectomy.[3] Tucker [4] reported one operative death in fifteen cases. During the last four years, thyrotomy has been performed for epithelioma of the larynx on twenty-three patients at The Mayo Clinic without an operative death. It is questionable, however, whether the operative mortality in thyrotomy, taking the cases throughout the country, is not higher than these data would seem to indicate.

The site of the tumor, its extent and its activity in and about the larynx determine the type of operation. Epitheliomas of the epiglottis and the epiglottic fold are usually of a low grade of malignancy. They occur practically always in men. They may be removed by means of

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1. Jackson, Chevalier: Les résultats des méthodes opératoires dans le traitement du cancer du larynx, Oto-rhino-laryngol. internat., 1922, vol. 6.

2. Thomson, St.Clair: Intrinsic Cancer of the Larynx, Operated on by Laryngofissure, Brit. M. J. **1**:743, 1928.

3. Thomson, St.Clair: Laryngo-Fissure for Intrinsic Carcinoma of the Larynx: Four Cases in Medical Men, Who Are Now in Active Practice, 2¼, 3, 4½ and 5½ Years After Operation, Proc. Roy. Soc. Med. (Sect. Laryngol.) **21**:1, 1927.

4. Tucker, Gabriel: Laryngofissure for Cancer of the Larynx: Report of Fifteen Cases, Arch. Otolaryng. **3**:20 (Jan.) 1926.

lateral pharyngotomy, according to the method of Trotter.[5] The postcricoid growths are practically always in women and are nearly always of a high grade of malignancy, usually graded 4. The lymphatics are frequently involved at the time of examination. If operation is attempted in this group, the procedure outlined by Trotter is advisable. For the more extensive, intrinsic laryngeal growths with fixation of the vocal cord and possibly some extrinsic extension, laryngectomy is the treatment of choice. If the lymphatics are involved in the low-grade epithelioma, the lymph nodes of the neck are removed surgically

Fig. 1.—First stage. The hyoid bone has been divided and the ends retracted laterally. The thyroid cartilage is exposed anteriorly.

before laryngectomy if the extent of the lymphatic involvement warrants such treatment. If, however, the malignancy is graded 4 with lymphatic involvement, the patient will not, as a rule, derive permanent benefit by surgical removal. Small growths of the vocal cord involving its anterior two-thirds without fixation are best removed by means of thyrotomy. I rarely see a case in which I feel justified in removing an epithelioma of the vocal cord perorally. Lynch,[6] however, reported

5. Trotter, Wilfred: The Surgery of Malignant Disease of the Pharynx, Brit. M. J. **1**:269, 1926.

6. Lynch, R. C.: Cancer of the Larynx, South. M. J. **20**:119, 1927.

twenty-two cases in which he removed an epithelioma of the vocal cord, varying in size from that of a "pinhead" to that of a "grain of rice," and in which the condition did not recur for from two to fourteen years. The grading of these small lesions would make an interesting pathologic study.

Postoperative reaction following thyrotomy is due to two conditions: infection of the tissues of the neck from the tracheal secretions, and trachitis, bronchitis and bronchopneumonia. The ordinary patient in excellent health is usually able to withstand these, but the patients

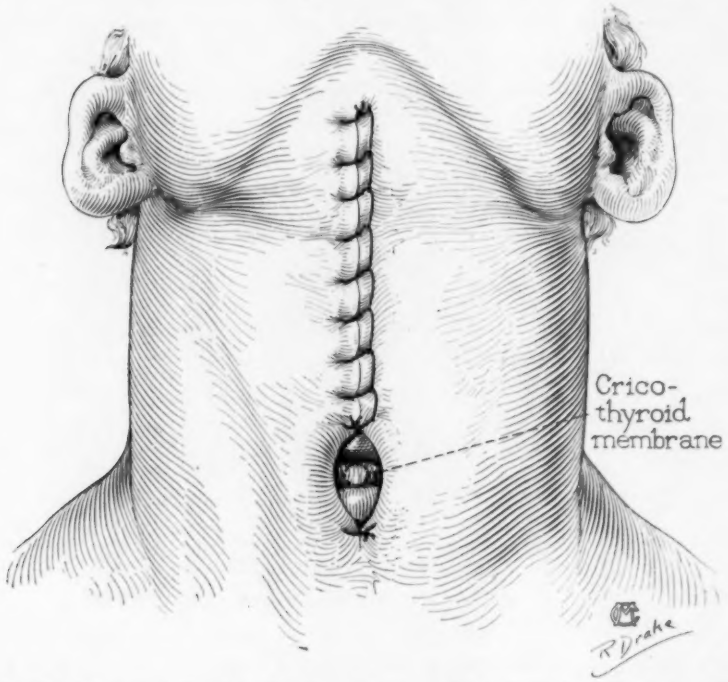

Fig. 2.—Closure following the first stage. About four days later an opening is made through the cricothyroid membrane as shown by the dotted line.

who present a bad surgical risk, owing to their age or to respiratory or cardiac diseases, are better guarded against these reactions by the two-stage operation. The operation I have employed in such cases has been as follows:

The median line of the neck extending from above the hyoid bone to just below the cricoid cartilage is infiltrated with 0.5 per cent procaine. The infiltration is carried down about the hyoid bone and laterally to the thyroid cartilage. The median line incision is then made, the hyoid bone is divided, and the ends retracted laterally by means of sharp retractors. This allows the larynx to come up into the

wound, which affords much better exposure. The muscles are removed from the anterior portion of the larynx extending down to the cricoid cartilage. The wound is closed with a dermal suture. This creates a clean wound which in four days is infected by making a small opening into the cricothyroid membrane or by removing a disk from the cricoid cartilage. A small tracheal tube may be inserted, if necessary, to maintain the opening. The patient becomes accustomed to the infec-

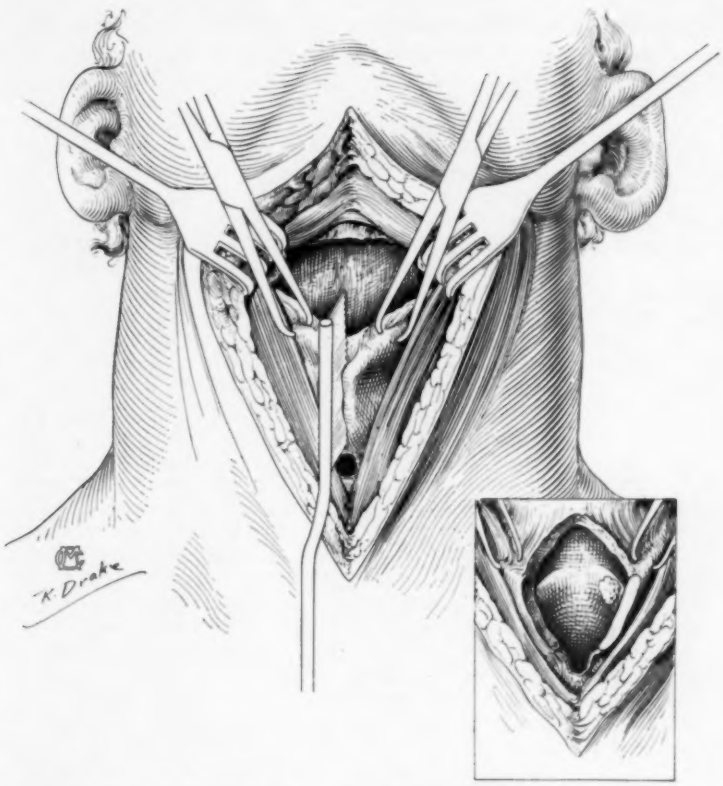

Fig. 3.—Second stage, about eight days following the first stage. The wound is freed with the index finger and the thyrotomy done with a saw. The insert shows the thyroid cartilage divided before removal of the growth.

tion from the trachea, and the trachea becomes accustomed to the air passing directly into it.

A few days later, usually four days, the second stage is done. Under block paravertebral anesthesia, the wound is freed by means of the index finger and the divided ends of the hyoid bone retracted. Small, sharp, pointed forceps pick up the upper end of the thyroid cartilage, and it is divided by means of a saw. The cricoid cartilage is not divided, however. The thyrohyoid membrane is partially divided

in the median line in order to give better exposure. The laryngeal growth is removed by dissection of diathermy, depending on the type and extent of the growth. Bleeding is controlled by catgut sutures, and the thyrohyoid membrane is approximated and the muscles sutured, anteriorly, to the thyroid cartilage. A split rubber tube is placed at the lower end of the wound down to the thyroid cartilage and left in place for forty-eight hours in order to avoid surgical emphysema.

The patient gets little postoperative reaction following this type of operation, because he has been accustomed in stages to the tracheal infection in the soft tissues of the neck and also to the tracheal opening.

Clinical Notes

A NEW AID IN TECHNICAL INSTRUCTION

The Use of Still Film in Place of Lantern Slides *

W. Wallace Morrison, M.D., New York

My purpose in this communication is to bring to the attention of those members of the profession who up to the present time have used the customary lantern slides for illustrating their technical lectures or their scientific papers, the possibility of the employment of still films for the projection of such illustrations, and the very decided advantages of the latter method.

Still films are composed of a series of separate pictures on standard 35 mm. moving picture film. Each individual picture, or frame, as it is called technically, measures 18 mm. high and 24 mm. wide. Since each picture is so small, fifty of them may be taken on a length of film about 3 feet long. Thus one can have fifty illustrations, enough for a long lecture or paper, on a roll of film which can easily be carried in the coin pocket of one's coat.

Such a length of still film can readily be made by any amateur photographer, at home, with comparatively simple and inexpensive apparatus. This is accomplished, in the first place, by the use of the miniature camera presented, and called by its makers the "Memo" camera (fig. 1). It is very small, measuring 2 inches (5 cm.) wide, 2½ inches (6.27 cm.) deep and 4 inches (10.16 cm.) high, and when loaded with a film, it weighs less than 7 ounces (198.45 Gm.). It is very simply, yet well constructed. On its upper end is a telescopic range finder for ordinary photography. The face of the camera has an exposure counter to indicate how many frames have been taken after setting the counter, when the camera is loaded with film. The lens is an excellent one, with very considerable focal depth, in a standard mounting. Both fixed or universal focus, and focusing models are available; the latter are made with stops down to either 6.3f, or 3.5f. All of the models have the usual timing stops. The shutter lever is on the side of the camera. The removable back of the camera bears the simple mechanism by which the film is moved along from above downward, after each exposure, to bring an unexposed frame of film into position behind the lens.

The 35 mm. film for use with the camera is supplied in lengths of 3 feet (91.44 cm.), contained in a carton measuring about 1¼ by 1½ inches (3.1 by 3.77 cm.) square. The film itself is enclosed in a reasonably light proof wooden cartridge, on a spring roller. One end of the film projects from a felted slot, for loading purposes. The camera can be loaded in subdued light, with the loss of only two or three frames; the cartridge will still contain sufficient film for fifty exposures.

The pictures made by photography with this camera are, of course, negative films. For projection, positive film transparencies are printed either on standard, nonburnable moving picture film, called "positive" film, by the makers of the camera, or on a simple printing apparatus furnished by them for the home laboratory. Such positive transparencies may be projected with any of the still film projectors on the market. The makers of the Memo camera offer a projector which they call the "Memoscope" (fig. 2). It is inexpensive, works directly from the usual 110 volt electric supply, and with its carrying case weighs only 4½ pounds (2.05 Kg.), so that it may be carried anywhere. It consists of a ventilated metal housing, containing one 100 watt special mazda projection lamp, which is easily renewable. A simple condensing lens carries the light through the film, and the focusing is done by a telescopic lens mounting in front of the film,

* Submitted for publication, Jan. 31, 1929.

in the simplest possible manner. The film is held in the device above the lens, and moved along a frame at a time in either direction by the handle which operates two gear wheels; these engage with the sprockets in the margins of the film. When one is using the projector, the film can be moved back and forth and a picture once passed can be recalled with great ease, and without delay, in contrast to projection by slides.

To illustrate a lecture or paper, pictures in books or pamphlets, drawings, charts, tables of printed matter, or, in fact, any printed material, can be photographed by the use of the Memo camera, and the copier supplied by its makers (fig. 3). This consists of a pedestal on which the camera is held by means of a standard tripod screw, fastening into the threaded socket in the bottom of the camera. The picture to be copied, technically called the "copy," is mounted on the movable copy board, and held in place, after centering, by the clips provided for this purpose. In order to make the lens of the camera of sufficiently short focus for copying, three supplementary lenses, similar to the familiar portrait

Figure 1

Figure 2

Fig. 1.—The "Memo" miniature camera.

Fig. 2.—The "Memoscope" still film projector.

attachment, are provided with the copier. One of these is placed over the lens mounting of the camera. The copy board is moved to a certain given distance from the face of the camera, and the copy illuminated, either by strong reflected north daylight or by any bright source of artificial illumination, such as a carbon arc light used for therapy, and the picture taken with a time exposure.

Illustrations can also be easily made of anatomic or gross pathologic specimens, of dissections, and of the steps of an operation on the cadaver, since with the focusing models of the camera, without the use of supplementary lenses, the subject may be approached to a distance of 3 feet; such a close-up will give very good detail. Even greater detail can be secured by using one of the supplementary lenses of the copier, and photographing the material at the required distance. For instance, excellent pictures of skin lesions may be obtained by using the middle focus supplementary lens, with the skin at a distance of 8⅛ inches (20.63 cm.) from the face of the camera.

Stained microscopic slides may also be copied directly by a microphotography method, such as is illustrated in figure 4. The camera is mounted on a standard

tripod in a horizontal position. The slide is placed on the stage, the portion to be copied accurately focused at the required power of magnification, and the field illuminated from below, by use of a 400 watt substage illuminator such as is shown. The lens of the camera is then accurately centered over the microscope ocular lens, and the photograph taken. The fact that the slide is stained in the usual way with aniline dyes will cause the various tissues to be caught with sufficient contrast so that the picture will resemble a half tone engraving.

It is quite easy to copy roentgen shadowgraphs of any portion of the body on the usual film or plate, by placing the shadowgraph against a suitable ground glass screen in front of a strong source of illumination and then photographing it with the camera, as one would a picture on the copier, by the light transmitted through the shadowgraph. Using an exactly similar method, one can copy his

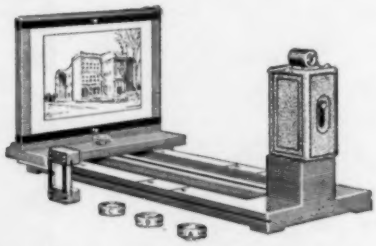

Fig. 3.—The copier, with supplementary lenses and ground glass focusing attachment.

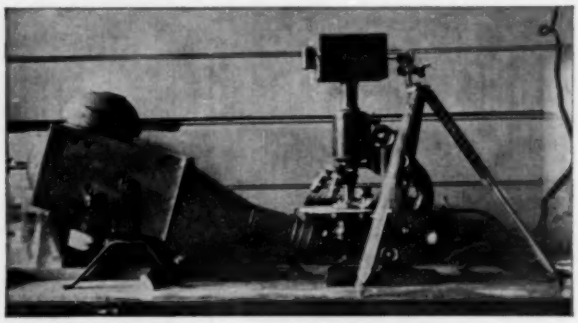

Fig. 4.—Arrangement of apparatus for photomicrography.

lantern slide negatives on still film, so as to replace the fragile slides with the almost indestructible film. Note that lantern slide positives cannot be so used.

To add interest to a length of film made of any sort of illustrations, titles and explanatory notes, statistical data, can be inserted by making use of a simple title board. The one used by the author consists of the familiar black cloth sign board, into the slots of which removable white celluloid letters fit by means of tabs. The title is spelled out on this board, and the whole photographed on the copier just as if it were a drawing. The letters stand out on the black background in very legible fashion (fig. 5).

The advantages of projection films so made over the customary lantern slides are many. Fifty illustrations or titles on 3 feet of film can be carried in one's change pocket; if one has more than one length of film on the same subject, the lengths may easily be spliced together end to end, to make a single roll, even 9 or 12 feet in length, with 150 or 200 pictures. Fifty lantern slides occupy a

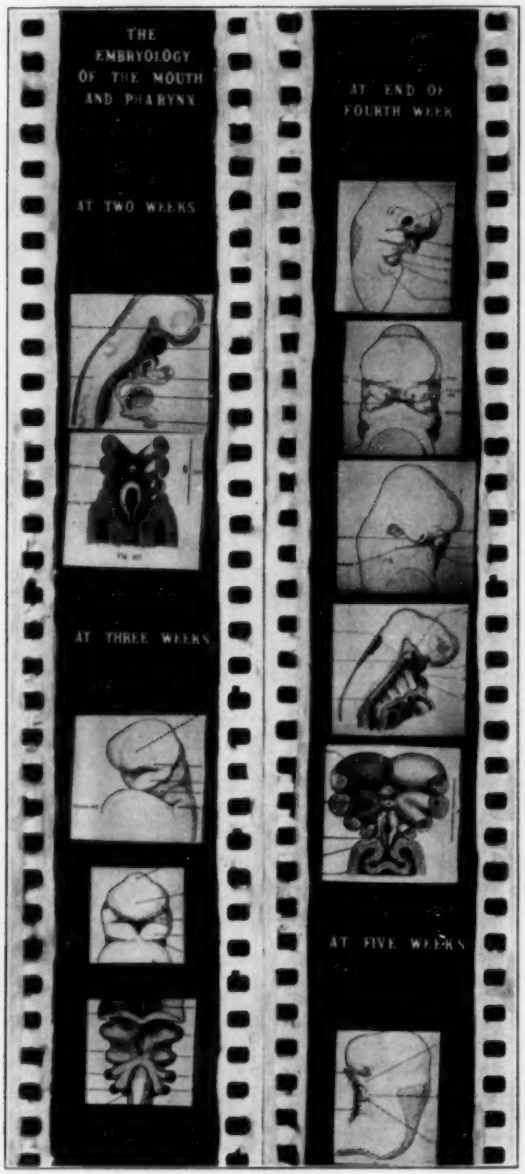

Figure 5

Figure 6

Fig. 5.—Specimen of film made by the author to illustrate a postgraduate course.
Fig. 6.—Specimen of film made with the "Memo" camera in ordinary use.

carrying case measuring 5 by 5 by 15 inches (12.7 by 12.7 by 37.54 cm.), and weighing about 10 pounds (4.5 Kg.) with the fifty slides. The positive films are nonburnable, difficult to tear and unbreakable; lantern slides are exceedingly fragile. Lantern slides require considerable space for storage, if one has many of them; even long rolls of film occupy only a small box in one's desk drawer. In point of cost, the advantage is overwhelmingly in favor of the film. Three feet of negative film costs 50 cents; any camera supply store will develop it for 10 or 15 cents. The positive film transparencies are made by the camera company for $1 for fifty frames or less. One can develop his own films at home for 5 cents or less a length; using inexpensive apparatus, one can print his own transparencies for considerably less than 2 cents a frame, at home. Thus 3 feet of positive film for projection costs not more than $1.65. Lantern slides cost at least $1 each. The saving by the use of film is obvious. A further advantage of the film is that when the negative film has been made, positive prints can be made from it at any time, to replace those that may be lost or torn; to replace broken lantern slides, one must bear the cost as initially.

Any one interested in amateur photography can make his own negative films. It will prove a fascinating hobby, is easy, and is done with equipment that is neither complicated nor expensive. Besides its use in a technical capacity, the Memo camera takes excellent photographs of any subject that an ordinary camera will take; the Memo camera has the advantages of very small size and portability. Its film cartridges are so small that many can be carried in one pocket while traveling. The exposures are made simply by sighting through the finder on the top of the camera, and touching the shutter lever, as quickly as one sees a desirable subject. The camera has been taken on long tours in this country and abroad by people who have taken thousands of pictures. From such negatives, film transparencies (fig. 6) can be made as already described, for home projection. Small paper prints for a miniature album can be made from the negative for a cent each. With clear and properly developed negatives, one can also have paper enlargements made, in size up to 3½ by 4½ inches (8.8 by 11.43 cm.), at a small cost.

SUMMARY

1. Strips of standard 35 mm. moving picture film can be employed for the making and projection of pictures for illustrating technical lectures, etc., with decided advantages over the lantern slides ordinarily used for this purpose.

2. Any amateur photographer can make his own films of almost any conceivable subject by using the miniature camera and the copier described. The simple projector also described offers a ready means of showing such films anywhere.

3. The camera and the projector also offer a truly fascinating hobby for the amateur photographer, at home or while traveling, who wishes to record pictures of the world about him, for reviewing at any time at his pleasure.

NOTE.—The Memo camera, the copier, the Memoscope projector, the films and other apparatus mentioned, are made by the Agfa Ansco Corporation, of Binghamton, N. Y.

39 East Fiftieth Street.

POUCH OF THE ESOPHAGUS*

HARRIS P. MOSHER, M.D., BOSTON

History.—A white woman, aged 65, married, who had no children and who had had one miscarriage at seven months, suddenly experienced difficulty in swallow-

* Submitted for publication, Dec. 13, 1928.

* Read at the Eleventh Annual Meeting of the American Bronchoscopic Society, Washington, D. C., April 30, 1928.

ing solid food about a year before I saw her. For the past six months she had been able to take only liquids and these slowly. There had been no regurgitation of the food and no spasm of the larynx. Warm drinks were swallowed much easier than cold. Her chief symptom other than her inability to swallow was a sense of constriction through the chest. For the past six months, a soft swelling had been present on the right side of the neck. By pressing on this, she thought that she could force food down. She had lost 30 pounds (13.6 Kg.) in the last eight months. There was no previous history of any pathologic condition of the chest. Three years before I saw her, she was treated for two years for peptic ulcer. The family history was unimportant.

Fluoroscopic Examination.—The whole esophagus was much dilated and filled with air. There was a pear-shaped pouch also filled with air. This was on the right and extended in the chest as far as the arch of the aorta. The lower end of the esophagus ended in an awllike point. The excursion of both halves of the diaphragm was limited. The lung triangles were dark. Two days later, the patient was examined under ether. Laryngoscopic examination showed that the larynx was normal. With the short esophagoscope, it was found that the opening of the esophagus was closed by the bulging forward of the esophageal wall against the cricoid cartilage. The esophagus, however, was easily entered and at a point 7 inches (18 cm.) from the incisor teeth the esophageal opening was found to be on the left and of good size. To the right of the center, the mucous membrane of the esophagus was thrown into folds. Ballooning reduced the folds and disclosed a pouch on the right. A longer esophagoscope was now inserted, and it passed the opening of the pouch easily. At 10 inches (25.5 cm.) from the incisor teeth, two sickle-shaped folds of mucous membrane were seen, one on the right and the other on the left of the esophagus. Following examination under ether, the patient swallowed much better. Five days later, the Sippy dilator was passed. It met slight obstruction at the lower end of the esophagus but passed easily into the stomach. The bag was inflated with air. The inflated bag showed a waistlike constriction at the lower end of the esophagus. Under a pressure of 3 pounds, the esophagus dilated to a diameter of from 19 to 20 mm.

After the esophagoscopic examination and while the patient was under the influence of ether, the swelling of the right side of the neck disappeared. Three months later, on December 29, the following note was made: The patient returned after three weeks' absence saying that at that time she was eating everything and that the swelling in the side of the neck had not returned. The discomfort which she had felt in her left side over the stomach and which she thought was caused by the pressure of gas had disappeared. Under the fluoroscope, the esophagus was found to be ballooned and filled with air. The fluid level was at the junction of the middle and lower third of the esophagus. The esophagus emptied readily with a compound effervescing powder. The Sippy dilator was introduced and was halted at 23 mm. A pressure of 3 pounds was used.

TECHNICAL ADVANCES IN OTOLARYNGOLOGY*

SIMON L. RUSKIN, M.D., NEW YORK

The two instruments described represent the application of some of the principles of mechanics for the improvement of surgical instruments. In performing the submucous operation for the correction of septal deflections, the anterior portion

* Submitted for publication, Nov. 28, 1928.

of the perpendicular plate frequently offers considerable resistance to the ordinary bone-cutting forceps. Breaking the bone in this area is both dangerous and uncomfortable to the patient. I therefore devised a forceps with a mechanical advantage of about four, so that the same force used in the hand gives four times the cutting power at the biting edge. It is surprising how easy the hardest septal bone is cut with this added mechanical advantage. The female portion of the forceps is slightly beveled, so that the cut piece is held gently in the instrument

Forceps and mastoid rongeur devised by author.

and is easily shaken out. This saves the time necessary for removing the cut particles. The easier cutting allows quicker and more accurate work.

The same advantages have also been embodied in the mastoid rongeur which I have devised, which is extremely useful for removing the mastoid tip and cortex, and obviates any breaking of the bone. For brain operations on the mastoid, rongeur is especially useful.

351 West 86th Street.

Progress in Otolaryngology

TONSILS AND ADENOIDS *

FRENCH K. HANSEL, M.D.
ST. LOUIS

In reviewing the literature for 1928 on the tonsils and the adenoids, I have selected only those papers which promote discussion and those which, according to my judgment, show the advances made in this particular field of otolaryngology during the past year. With each advancing year, knowledge of the tonsils in relation to other diseases is increasing. There seems to be an increasing tendency for the laryngologist, not only to base his reasons for tonsillectomy on the character of the tonsils, but to consider more carefully their relation as a focus of infection in other diseases, regardless of their appearance.

Although certain observers continue their investigations on the physiology of the tonsils, little has been added to previous knowledge. Interesting articles have been written by Sercer and by Slobodnik on the embryologic phases of the tonsils. A most comprehensive work on the muscular attachments of the tonsil was done by Fowler and Todd.

Much attention has been given to the subject of aspiration of blood during tonsillectomy and abscess of the lung following tonsillectomy.

GENERAL CONSIDERATIONS

In the statistical studies of the children in the public schools for the deaf, Shambaugh and others investigated the relation of the tonsils and adenoids to lesions of the middle ear. In the analysis of these statistics he especially called attention to the fact that tonsil and adenoid trouble, although a factor in producing mild cases of deafness in children, can hardly be held responsible, even remotely—that is, through the production of a suppurative otitis media with secondary extension to the labyrinth—for the production of deafness in any of these children, since the suppuration of the labyrinth would have to be bilateral, which is, of course, extremely improbable.

Under the title of adenoid deafness, Sturm reported the results of his investigation on this subject. He stated that chronic progressive deafness begins in childhood. In a series of 200 cases of deafness, 32 per cent followed nasopharyngeal diseases in childhood. If 32 cases of otosclerosis are excluded, the incidence of adenoid deafness in this series was 32 per cent. He described the normal image of the drum head in detail. The development of adenoid deafness is divided

* Submitted for publication, March 21, 1929.

into three stages, namely: a stage of occlusion, a stage of transudation and a stage of cicatrization. Each of these stages is described with remarks on the resulting otoscopic image. Fixation of stapes is mentioned as a frequent occurrence in adenoid deafness.

In the routine physical examination of nurses entering training at the Presbyterian and Cook County Hospitals, Rhoads and Dick found fairly large pieces of tonsillar tissue remaining in the throats of 290 of 403 (73 per cent) who had had tonsillectomy performed. That such "tonsil stumps" frequently cause trouble was proved by a study of a series of 23 cases.

The most frequent object in removing tonsils is to rid the body of tissue harboring bacteria capable of producing disease in other parts of the body. Yet it is shown by this work that tonsillectomy as usually done, even by specialists of established reputation, fails to accomplish this because of incomplete removal of infected tonsillar tissue; this is true in 73 per cent of the cases. There is even some indication that in many instances the condition resulting from incomplete tonsillectomy is worse than that existing before operation.

From this most commendable study these authors concluded that "tonsil stumps" have considerable clinical significance, as shown by the fact that in a fairly large series in which cultures were taken, the "stumps" harbored more pathogenic bacteria per gram than tonsils removed the first time. Clinical cases were studied in which patients with systemic diseases attributable to foci of infection failed to improve after the original tonsillectomy, but improved strikingly after removal of the pieces of tonsillar tissue remaining after the first operation.

The efficacy of tonsillectomy in selected cases was shown in the cases investigated by Patterson and Bray. Five hundred children who had come to the hospital complaining of various symptoms and who were found to have septic or hypertrophied tonsils reacted in an almost uniformly satisfactory manner to tonsillectomy and rapidly gained weight.

The result of tonsillectomy in patients with preexisting endocarditis was the particular feature of Farnum's study. Five hundred and twenty-six patients were followed for from two weeks to nine years. The ages at the time of admission were from 12 to 72 years. These patients knew of existing cardiac disease or had had subjective symptoms of heart disease for from two weeks to twenty-five years before admission. All cases reported gave definite evidence of endocarditis, with the exception of 28 in which the patients were suffering from myocardial changes severe enough to give symptoms of mild or severe decompensation. As etiologic factors in the production of cardiac infection, 295 gave a history of acute rheumatic polyarthritis, 51 of chorea and 275 of acute tonsillitis (several attacks), and 62 had positive Wassermann reactions. In this group of 526 patients, 180 had a tonsil-

lectomy performed after coming under observation. Most of the operative procedures were done under general anesthesia (ether). This was the anesthetic of choice because the patients with heart disease seemed to do best under ether anesthesia. Practically all these patients were given a longer rest than usual in bed after operation, and were seen by specialists in diseases of the heart. A number were returned to medical wards after operation and, if necessary, remained hospitalized for a considerable period. Any flare-up of temperature, arthritis or symptom of decompensation, however mild, was given adequate consideration and treatment. These patients with few exceptions stood the shock of operation surprisingly well. Farnum found that tonsillectomy in the types of existing diseases of the heart mentioned should not be expected to arrest the progress of such disease to any marked degree. Tonsillectomy, although carried out under as nearly ideal conditions as may be obtained, will initiate an attack of acute rheumatic polyarthritis in a certain number of cases and further an acutal spread of endocardial or myocardial infection. Tonsillectomy does not by any means stop the recurrence of sore throat. Such sore throats are oftentimes concomitant with acute rheumatic polyarthritis and the evidence of renewed cardiac involvement. Tonsillectomy in this group of cases does not seem to have a great effect on the recurrence of chorea, as about 20 per cent of the patients in both the tonsillectomized and the nontonsillectomized group had recurrences. Tonsillectomized patients had decompensation with or without fever. It seems fair to Farnum to conclude from these facts that in adults with existing cardiac disease, the hope for improvement placed in tonsillectomy has been based on a shaky foundation. If tonsillectomy is to be generally used in the future as a definite therapeutic measure in cardiac disease, the best results will be obtained before the incidence of heart infection or early in its course.

Of 413 rheumatic children observed by Wilson and others over a period of from one to ten years, 247 were subjected to tonsillectomy. Manifestations of infection recurred in 47.7 per cent and appeared for the first time in 34.7 per cent of the treated children. In only 17.5 per cent was there no manifestation of rheumatism after the operation. In rheumatic children less than 9 or 10 years of age, recurrent attacks were frequent, whether or not tonsillectomy had been performed. In older children, recurrent attacks became less frequent regardless of enucleation of tonsils. The age at which tonsillectomy was performed and not the fact of tonsillectomy appeared to be the significant factor in the incidence of nonrecurrence of infection after operation.

Robey has found that tonsillectomy for these patients is as safe as any other surgical procedure, and he cannot see any difference, as far as the operation is concerned, between the results in patients operated

on during the height of rheumatic fever and those operated on during the intervals between attacks. He reports good results.

Chronic inflammation of the tonsils causing a prolonged reaction in the organism of the nature of chronic sepsis Egorov terms "tonsillitis lenta." Symptoms referable to the heart result from it; there may be rheumatism, septic endocarditis and pancarditis. A diagnosis of endocarditis following tonsillitis is frequently made when the condition is actually tonsillitis lenta with cardiovascular syndrome. The nerve plexuses in the heart are affected through infection of the cervical and upper thoracic sympathetic ganglions and, to a lesser degree, through infection of the ganglions in the wall of the heart. This entire picture Egorov combines clinically in a "cardiotonsillar syndrome." Infection of the reflexogenic zones of the walls of the carotid artery affects the rhythm of the heart, the blood pressure and respiration. The cardiotonsillar syndrome is divided into arrhythmic, stenocardiac, asthmatic and myasthenic symptoms. Juvenile arrhythmia might be explained as an irritation of the reflexogenic zone of the carotid, which is changed in size during the respiratory phase of the jugular vein.

Bloomfield concluded that certain persons possess a "natural" or at least an unexplained resistance to hemolytic streptococcal infection of the lymphadenoid tissues of the throat. There is a significant positive association between susceptibility to two types of infection of this sort—acute follicular tonsillitis and scarlet fever. There is no significant association between susceptibility to tonsillitis and diphtheria or to scarlet fever and diphtheria. The observation herewith presented indicates that invasion of the lymphadenoid tissues of the throat by scarlatinal, as well as by other, hemolytic streptococci depends on some common factor of susceptibility.

Wahlig determined the urea content of the blood in forty cases of scarlet fever and in twenty-five cases of tonsillitis. In only four of the cases of scarlet fever were considerably increased values found; in two of these there was demonstrable injury to the kidneys. In none of the cases of tonsillitis did the urea content of the blood exceed normal limits.

Sidlick says that it is feasible for a chronic septic focal infection to cause disease of the skin, and that the eradication of the focus is followed by the disappearance of the disease. An example of this is lupus erythematosus. To the extent that such an etiologic relationship existed between tonsillar infection and eczema in infants and children, it would have been demonstrated when the tonsils were removed in forty-two patients in an attempt to cure their eczema. In each case there was improvement after tonsillectomy, followed by relapse.

On the basis of an epidemic of follicular tonsillitis in a hospital ward of eleven beds in which four patients with exophthalmic goiter or iodine

hyperthyroidism were attacked while the other patients with various diseases (including one with exophthalmic goiter who had just recovered from erysipelas) escaped, Csepai suggested a connection between hypertonia of the sympathetic and predisposition to tonsillitis.

In making a study of the relation of the tonsil to albuminuria, Jones added seventeen cases to a group of twenty-seven previously reported. He called attention to the frequency of acute nephritis with acute tonsillitis and referred to work done by other observers. He referred to Adler, who made the statement that nephritis occurs in 75 per cent of the cases of pure tonsillitis. Jones concluded that routine tests disclose the presence of albuminuria or other evidences of nephritis in the majority of cases of acute tonsillitis or other tonsillar infections.

In cases of albuminuria of doubtful origin, careful examination of the pharynx may often determine the etiologic relationship of diseased tonsils. Hypertrophy or severe inflammation of the tonsils is not necessarily an index of the etiologic relationship of the pharyngeal lymphoid tissue to renal involvement. Even small tonsils or a mild attack of tonsillitis may provoke marked nephritis.

Thorough enucleation of the tonsils including the subtonsillar lymphoid tissue and adenoid vegetations assures the prompt cure and prevents the recurrence of the related albuminuria.

Hazen has made the observation that it is unusual to find a patient with pityriasis rosea who does not have any evidence of tonsils. This led to a review of eighty-five consecutive cases. Of forty-six cases for which the notes were complete, the condition of the throat was satisfactory in only two instances. These figures clearly indicate that pityriasis rosea is much more frequent in those who have either tonsils or other marked lymphoid structures in the throat than in other persons.

PHYSIOLOGY AND ANATOMY

In Kelemen's study of the explanation of tonsil tissue, the tonsils were removed from adolescents by the Sluder method and parts away from the surface and the crypts selected. They were kept alive as long as seven days in human plasma. The tissue changes rapidly to the embryonal form. After the first few days, the colonies of bacteria at the margin disappear, indicating a bactericidal influence of the tonsil tissue. The reaction of the tonsil tissue to plasma is different from that of other tissues, particularly of lymphatic tissue.

A comprehensive contribution on the muscular attachments of the tonsil and their practical significance in tonsillectomy was made by Fowler and Todd. The relation of the muscles adjacent to the tonsil is clearly illustrated and explained. The tonsil, a lymphoid lined pocket, consists of an upper lobe which is a hood and a lower lobe which is called a pocket. These are marked off from each other by a groove in

the capsule. They show that the superior constrictor muscle is not an immediate relation, as the palatopharyngeus lies between it and the capsule, to which it is attached at the groove between the upper and lower pockets by a bundle of fibers. This muscular attachment they have designated as the tonsillopharyngeus muscle. If this muscular attachment is teased through, complete enucleation of the tonsil can be carried out easily without injury to the underlying structures.

A study of the pharyngeal hypophysis and adenoids was reported by Slobodnik, in which he stated that embryogenically the pharyngeal hypophysis is closely connected with the cerebral hypophysis. The former develops from the outer hypophysis pocket (Rathke's pocket) and enters through the craniopharyngeal canal in the sphenoidal bone into its permanent place. This portion forms the anterior lobe of the hypophysis (adenohypophysis). The posterior lobe (the neurohypophysis) develops from the base of the midbrain. These two parts are histologically different. Traces of the craniopharyngeal canal rarely persist. The pharyngeal hypophysis is located at the upper posterior border of the vomer, where it meets the sphenoidal bone. In the adults, it measures from 6 to 7 or 9 mm. in length, and is from 0.5 to 1 mm. in thickness. The shape varies. In some cases the basophils are absent in the pharyngeal hypophysis, whereas they are always present in the hypophysis. The chromophil elements surpass the chromophobe elements in the cerebral hypophysis, whereas the relation is just the reverse in the pharyngeal hypophysis. Some authors think that the pharyngeal hypophysis and the cerebral hypophysis have similar functions; others deny this. Slobodnik thinks that there is not any absolute relation between the two. In certain instances of tumors of the hypophysis, in cases of dystrophia adiposogenitalis, compensatory changes were not observed in the pharyngeal hypophysis. In a case of tumor of the hypophysis (Christeller) with symptoms of dystrophia adiposogenitalis, the histologic picture of the pharyngeal hypophysis pointed to vicarious hyperfunction. In adenotomy (the author does not perform adenectomy), the pharyngeal hypophysis is not touched. The author suggested that the pharyngeal hypophysis be examined histologically in all necropsies in cases of acromegaly and diseases of the cerebral hypophysis and other endocrine glands.

A most interesting observation on complete anotia combined with aplasia of the tonsil was made by Sercer. He stated that microtia is seen frequently, but that anotia occurred rarely, only five cases having been reported (Lynch, Krampitz, Colomiatti, Chiari, Iwata). Two were bilateral, two were left-sided and one was right-sided. The case observed by Krampitz was that of a boy, aged 8 years, with a defect of the thumb and dextrocardia. Golomiatti's patient, aged 35, heard

various tones by bone conduction. Other cases that might, however, be classified as microtia were mentioned by Polidoro Virgilius (1531), Lycostemus (1557) and Lachmann (1675). Sercer described a case in point. An infant girl, aged 5 months, came from a family without physical defects. The parents were not blood relatives. The right auricle was missing entirely. The skin on the right side of the head was perfectly smooth. The right half of the soft palate was not well developed. The right tonsil and the right anterior palatine arch were absent. Instead of the palatine arch, a fold extended directly to the alveolar process of the upper jaw. The posterior palatine fold was reduced to a flat fold of the mucous membrane which led from the epipharynx downward. Schmidt saw a patient with absence of the tonsil and defect of the testicle on the same side. A malformation of the outer ear is independent of a malformation of the middle or inner ear. The arrest of development in the author's patient concerned the outer portions of the groove of the first branchial cleft and the inner portions of the second branchial cleft. It can be assumed that the organs which develop from the interjacent tissue were arrested in their development, namely, the dorsal portion of the first and second branchial cleft and the medial portion of the first branchial cleft. These are the ossicles and the tubotympanal tube. The author stated the belief that aplasia not only of the outer ears and the tonsil, but also of the middle ear with the tube, was present.

PATHOLOGY AND BACTERIOLOGY

In a review of the research work of the Viennese clinic on the tonsil problem, Waldapfel discussed the problems of physiology and pathogenesis and the results of the investigations carried on during the last years. He referred to the work of Schlemmer on the lymph streams to, in and from the tonsils. In these histologic studies, Schlemmer showed that the lymphoid tissue of the pharynx is not interpolated into the course of the lymph vessels, but is situated peripherally. This tissue, therefore, can be only the origin and source of the efferent lymph vessels and never a passageway and filtration station, as is actually the case in ordinary lymph glands. The lymphoid substance is only an integral part of the pharyngeal mucous membrane and is never an individual organ. Therefore, one should not speak of the function of the tonsils alone, but of the function of the whole pharyngeal mucous membrane, a part of which is the lymphoid tissue and therefore also the tonsils. His experiments with the injection of dyes showed that neither the palatine tonsils nor the remaining lymph tissue of the pharynx possesses afferent vessels.

To determine whether streptococci have anything to do with the clinical picture of tonsillitis, Waldapfel injected into his own cubital

vein 20 cc. of the blood of a patient with tonsillitis, and one day rubbed into his own tonsils, after previous scarification, a smear from the diseased tonsils. Both experiments gave negative results. His conclusions from these experiments were:

1. Tonsillitis cannot be transferred by inoculation from tonsil to tonsil or by the transfusion of blood from diseased to healthy persons.
2. The phagocytic power of the patient's blood against the streptococci cultivated from the patient's tonsils increases in direct ratio with the stage of healing, and the resistance of the organism against these streptococci increases likewise.
3. This increase in resistance of the organism is directed specifically only against the strain cultivated from the patient; against foreign strains the organism does not show an increase in the power of defense with progress of healing.
4. The streptococci in persons with tonsillitis are not accidental and secondary symptoms, but are in close relation to the disease and its course.

The problem as to how inactive streptococci become active and such dangerous factors in tonsillitis was also considered. The factor that enables the bacteria to develop and exhibit their power was investigated. This was thought to occur at an early stage before the appearance of typical clinical symptoms. Four patients were found for investigation. When the blood from these four patients was used as culture medium for the streptococci taken from the tonsils, these streptococci became much more virulent than when cultivated on normal blood or bouillon. From these experiments, Waldapfel concluded that some unknown factor activates the streptococci in tonsillitis. Perhaps the common cold may disturb the normal biologic equilibrium and enable the secondary factor, namely, the germ to play its part.

Grossman and Waldapfel studied the changes in tonsils in the state of acute inflammation. It was concluded from these observations that lacunar tonsillitis is not a superficial disease but a deeply extending destructive process. Studies were made of the lymph follicles in the tonsils. This work brought out the fact that the lymph follicles and germ centers are not exclusively, if at all, centers of production of lymphocytes.

Maclachlan and Richey reported on the microscopic changes in tonsils in cases of rheumatic fever and chorea. In eighteen cases of rheumatic fever and five of chorea, a study of the capsular and pericapsular tissues of the tonsil showed perivascular lesions consisting of lymphoid and plasma cells in fourteen of the former and four of the latter. In addition to this atrophic muscle giant cells, fibrosis, bone and cartilage and foreign-body giant cells in various parts of the tonsil were encountered. An endothelial proliferative reaction of the lining cells of the capillaries and perivascular lymph spaces was noted in eleven cases. Some of the endothelial cells were multinucleated and were associated with granulomatous-like lesions in six instances. The

endothelial cell response was the principal feature in this study. Maclachlan and Richey were not prepared at the time to state that it is a specific reaction in the tonsil for rheumatic fever or chorea.

Murray and Maxwell reported a case of tuberculosis of the tonsil in which tonsillectomy was followed by ulceration of the faucial pillar and later of the larynx. Although the chest had been examined repeatedly for tuberculosis, the disease was not found until a roentgen examination revealed a somewhat extensive involvement of both lungs. Evidently a latent tuberculosis had been aggravated by the operation. The patient died of generalized tuberculosis with a terminal meningitis after an illness extending over six months.

A study made by Scarff and Whitby of 200 cases emphasizes the necessity for tonsillectomy in all cases in which removal of tuberculous glands in the neck is necessary. Without tonsillectomy a focus of infection remains active. The incidence of tubercles in tonsils was 3 per cent. This is a marked lowering of previous figures, which is attributed in part, if not wholly, to the improvement in the milk supply and to the education of the public in regard to the danger of using infected milk.

Horgan reported a case of multiple miliary tuberculous foci scattered throughout a tonsil in which the tonsillar lymph glands were not enlarged; the larynx looked normal; the lungs were healthy, and the sputum did not contain tubercle bacilli. The Wassermann reaction was negative. There were no subsequent developments in this case.

Lumsden endeavored to show that tonsillar infection is a factor in the causation of disease of the gallbladder. Of twenty-three cases of tonsillar infection so far investigated by him, eighteen have shown a growth of the nonhemolytic streptococcus, and more than half of these have given pure growths. The staphylococcus has been the next commonest organism obtained, while the *Bacillus coli* group has been conspicuous by its rarity, as have also hemolytic streptococci. In two cases pure growths of staphylococci have been obtained, and in another two, *Bacillus coli* only has been found. In no case was a pure hemolytic streptococcus obtained. So far the tonsils of three patients with definite cholecystitis have been investigated. The streptococci from each of these were injected into rabbits, and in all of the rabbits so far examined there is some change in the gallbladder.

Liebermann suggested that tonsillitis in a tonsil not chronically diseased acts as an immunizing process for the organism. He proposed the protective inoculation of children with blood from patients convalescing from tonsillitis as a test of the theory.

A case of osseous and cartilaginous metalplasia in the tonsils of a diphtheria carrier is described by Hirsch and Corten. The tonsils were examined histologically after removal. Bone was substituted for young cartilage developing from connective tissue. The bone continued to

grow within certain limits. Inflammatory changes were not found in the connective tissue. Diphtheria is a typical disease of the surface which never penetrates deeper by infiltration. Degenerative processes beneath the surface could be expected, in consequence of the resorption of toxins. These processes were not found; yet they may have existed previously and caused atrophy of the adenoid tissue in the tonsil. Larger scars in diphtheria are usually signs of a mixed infection. The capsule of the tonsil is favorable to the formation of cartilage with secondary ossification, because it develops from the second pharyngeal pouch. The formation of cartilage and bone in the author's case had continued through apposition after the inflammation had subsided. This growth persisted until the tonsils were removed. Therefore, a genuine metaplasia of the connective tissue into cartilage, with secondary endochondral and ecchondral ossification, had taken place. The diphtheria bacilli had found a favorable soil in the deep crypts of the tonsils in which they could live for an indefinite time without being injurious to the carrier. They could scarcely be influenced by disinfectants. A direct connection between the diphtheria bacilli and the metaplastic processes could no longer be shown.

COMPLICATIONS

In a series of fifty cases of tonsillectomy performed under local anesthesia, Iglauer made observations on the larynx and trachea as to the presence of aspirated blood. His conclusions on this work are:

1. In tonsillectomy performed under general anesthesia, aspirated blood is found in the trachea and main bronchi in at least 40 per cent of the cases.
2. In tonsillectomy under local anesthesia, some aspirated blood is found in the trachea in 38 per cent of the cases.
3. Posttonsillectomy abscess may be explained by the occasional prolonged retention in the bronchi of aspirated blood, crypt contents, tonsil tissue and buccal secretions.
4. The recent successful experimental production of lung abscess by Allen, Crowe and Scharff, show that retention of the infecting agent is the all important factor in the causation of lung abscess.
5. Both clinical and experimental evidence indicate that aspiration of infective material is responsible for the majority of postoperative lung abscesses.

In a study of the tracheobronchial tree in children with reference to blood aspirated during tonsillectomy and adenoidectomy performed under ether anesthesia, Vail examined a series of 100 cases; 62 showed blood in the larynx and trachea in varying amounts; 39 showed blood in varying units in the right bronchus and 31 in varying units in the left bronchus. Previous work by Myerson showed 79 of 100 cases with blood in varying units in the tracheobronchial tree. In another series, Myerson found 76 out of 100 cases. Louis and Ray Daily found 78 in 100 cases.

Tucker, discussing suppuration of the lung, pointed out that bronchoscopically there is evidence that the infection occurs by both the inspiratory and the embolic routes, and that from the local bronchoscopic and roentgen examinations it is often possible to tell by which route it has occurred in the individual case. Clinically, both types of abscess are amenable to bronchoscopic drainage if the patient is seen early.

In discussing the medical aspect of this subject, McCrae said that every patient discharged following tonsillectomy should return at once if any symptoms of thoracic disease occur within three months. A cough is the chief symptom and should be specifically mentioned. Patients should be carefully examined before tonsillectomy as to respiratory infections (acute) and possibly pulmonary tuberculosis.

Bryan called attention to the presence of the streptococcus as a factor in abscess of the lung. The aspiration of infected material and lung infarction are apt to follow tonsillectomy. The latter he believed due to excessive trauma at operation. He advocated careful use of the suction during general anesthesia.

In a report of a case of abscess of the lung following tonsillectomy, McKinney concluded that the patient (aged 15) might have lived if bronchoscopic treatment had been administered early. All indications pointed to the presence of an abscess of the lung two weeks subsequent to the operation, and bronchoscopic treatment administered at that time or shortly thereafter would have resulted in saving the patient.

Complications of the lung following tonsillectomy include pneumonia, abscess and the presence of a foreign body. The infections caused by these give a varied symptomatology and prognosis. A series of fifteen abscesses of the lung following tonsillectomy is described by Fischer. The prognosis for spontaneous recovery is fairly good. Death results for the majority of patients that do not recover within three months.

Werboff asserted that both tonsillitis and appendicitis often lead to nephritis; hence frequent examination of the urine is imperative in these diseases. The nephritis is a metastatic process manifested only by pathologic sediment in the urine. Severe hematuria should call to mind appendicitis. Appendectomy is followed by a speedy retrogression of the nephritis. Three cases of chronic glomerulonephritis following tonsillitis in children, aged 10, 11 and 15 years, respectively, are cited. Tonsillectomy was followed by marked improvement of the patients' health. A case of glomerulonephritis caused by appendicitis is also reported. Removal of an inflamed appendix led to the disappearance of all symptoms of nephritis.

In a great majority of cases of chronic progressive glomerulonephritis, Kollert and Suchanek stated the belief that somewhere in the body might be found an inflammatory focus that is of primary impor-

tance for the renal disease. When this focus is in the tonsils, the peritonsillar tissue, particularly the glands lying in front of and behind the submaxillary gland, will frequently be found involved. When this is the case, the results of tonsillectomy are likely to be disappointing. The authors do not perform tonsillectomy in the presence of severe peritonsillar disease, in hypertension when the blood pressure is about 160 mm. of mercury, in relatively young persons, in the presence of preuremic signs or if the test for renal function shows that only a small portion of the kidney is capable of function. If tonsillectomy is to be done, the great danger of infection of the peritonsillar tissue necessitates special measures. Instead of extensive infiltration with the local anesthetic, infiltration of the palatine arch only is advisable. All squeezing of the tonsils must be avoided. Infection of the field of operation from the buccal cavity is combated by painting with a bactericidal dye.

Markson reported a case of acute follicular tonsillitis in which, under treatment, all symptoms had subsided by the fifth day. On the sixth day, symptoms of acute endocarditis and an erythema nodosum appeared. They became acute. Salicylates proved ineffective, but one injection of 10 cc. of antistreptococcus serum was followed by prompt defervescence. A second injection led to complete recovery.

Knick referred to the high mortality in cases of tonsillar sepsis. Of fifty reported cases, cure was obtained in ten. The author reported in detail a case of his own in which a thrombus was found in the vena facialis communis extending into the vessels anterior and posterior and the venae tonsillares and ascending pharyngeal and even to the vein from the parotid gland, and the communicating veins to the front of the neck. The jugular vein was tied, and the vena fascialis communis was incised. He stated the belief that the jugular vein should not be tied unless thrombosed, but the dissection should uncover the paratonsillar region, and all thrombosed veins should be incised. It is not believed that tonsillectomy is desirable at this time, as it interferes with nourishment, and the sepsis is beyond the tonsils.

An interesting case of spontaneous hemorrhage from the tonsil was reported by Dabney. There was a swelling of the cervical region posterior to the angle of the jaw. Blood flowed from a large crypt in the tonsil. After operation, examination of the tonsil showed a deep crypt which penetrated into a plexus of vessels on the posterior pillar. Hemorrhage, therefore, was probably caused by an extension of a chronic inflammatory process in the crypt to the plexus of vessels and an ultimate ulceration into this vascular mass.

Temporary ligation of the common carotid artery for control of hemorrhage following tonsillectomy was performed by Hoffman. Following the removal of a tonsil, an arterial hemorrhage developed which could not be controlled by ordinary measures. Attempts to grasp the bleeder

with artery forceps were unsuccessful; compression for five hours did not cause clotting. As a last resort, the common carotid artery was dissected free. Ligation of the external carotid artery had no effect on the spurting vessel. Compression of the common carotid, however, at once stopped the bleeding. A stout silk ligature was passed around the artery and tied once, then a small gauze sponge was laid on it, and the ligature was tied twice over this. On the third day, the ligature was removed; the artery instantaneously resumed its volume. It appears that by this method of ligation thrombus formation can be avoided.

A fatality following the injection of a local anesthetic was reported by Snapp. A healthy patient, aged 26, was prepared for local tonsillectomy. Ten cc. of 0.5 per cent procaine hydrochloride containing 6 drops of epinephrine to the ounce was injected. The patient developed convulsions and died suddenly. The procaine hydrochloride was analyzed, and the solution was found to be correct; no cocaine was used. Postmortem examination gave negative results.

An analysis of the reports of fatalities following the use of local anesthetics, with a résumé of recent studies on the subject, including a summary of fourteen additional fatalities not hitherto recorded, was made by Mayer. Fourteen deaths occurred during 1925, 1926 and 1927. These immediately followed the use of a local anesthetic for various disease conditions. Cocaine was used in three cases, cocaine procaine hydrochloride in two, procaine hydrochloride in eight and butyn in one. Of the deaths from cocaine, two occurred in cases of tonsillectomy. The two deaths from cocaine procaine hydrochloride also occurred in cases in which operations were performed on the tonsils. Of the eight deaths from procaine hydrochloride two occurred in cases in which operations were performed on the tonsils, and the death from butyn occurred during a similar operation.

It is recommended that potassium sulphate be added to the procaine hydrochloride solution. Cocaine should not be used with procaine hydrochloride. Danger of substitution should always be borne in mind. Analysis of the local anesthetic should always be made in cases of fatality.

Observations in 290 cases of peritonsillar abscess were reported by Greenfield. This complication occurs by infection of the peritonsillar space through the lymphatics and by rupture through the capsule of the tonsil. Atypical peritonsillar abscesses occur in atypical locations in cases in which previous peritonsillar infection has occurred. The usual type of peritonsillar abscess is located in the supratonsillar fossa. In another type, the pus burrows downward, the tonsil is displaced forward and there is bulging of the posterior pillar. There is pain on swallowing and inability to open the mouth. In a third type of case, the abscess is located behind and external or lateral to the tonsil. This is a deep

abscess which occurs at the middle or lower pole. There is swelling at the medial part of the tonsil, extending to the last molar tooth. Inability to open the mouth is frequently encountered. These abscesses are so deep that it is difficult to open them. In a fourth type of abscess, the pus burrows through the superior constrictor muscle to the pharygomaxillary space. Cervical and mediastinal abscess may also occur. Another type of abscess, which appears in the region of the last molar tooth, is designated paratonsillar. The abscess extends between the insertion of the pterygoid and the ascending ramus of the jaw. The collection of pus pushes the pterygoid against the superior constrictor which displaces the tonsil toward the middle line. There is marked inability to open the mouth. There is another type in which a collection of pus is found at operation.

Peritonsillar abscess must be differentiated from retropharyngeal abscess, diphtheria, sarcoma of the tonsil and Vincent's angina. The author mentioned several cases in which serious complications occurred. One patient died of general sepsis and meningitis. In three cases there was severe hemorrhage, but all of the patients recovered. A case of acute laryngeal edema resulted, two cases of cervical abscess, one case of polyarthritis and one of acute endocarditis; all of the patients recovered.

In the treatment of these patients, Greenfield advised early incision of the abscess. He stated that the pus is usually present about the third day, and the abscess should be opened at this time. Hot packs to the neck and hot irrigations for the throat are recommended. The most important and the most difficult factor in the incision of the abscess is the selection of the site for opening.

Extensive purulent peritonitis found after death was reported by Hill in a case of blind peritonsillar abscess. The patient gave indefinite abdominal symptoms for six months previously. A pelvic operation had been performed, and this inflammatory pelvic process may have been aggravated by the infection of the blood stream from the tonsil.

Wallgren has written a most interesting report on erythrocyturia following tonsillectomy. He also observed the influence of tonsillectomy in 32 cases of glomerular nephritis. In a group of 140 cases without nephritis, blood appeared in the urine in 35. Red cells appear in the urine within three days. The blood remained in the urine one day in the majority of nonnephritic cases. In the nephritic cases it lasted from one to fourteen days. In nephritic patients the symptoms often reveal a change for the worse in connection with tonsillectomy. Even in patients with previously healthy kidneys, renal irritation sets in after tonsillectomy, though much more rarely than in patients with nephritis. This irritation of the kidney is, as a rule, insignificant and reveals itself in the form of scattered red blood

corpuscles, more rarely with other sedimentary elements in the urine, and lasts only a short time—one day, as a rule. But it can be so severe that the urine may become microscopically bloody, and the condition may last for days or weeks. In most cases, the first symptoms do not appear until the second day after operation. The cause of this post-operative irritation of the kidney is probably reabsorption of toxin from the surfaces of the wound.

Jordan presented a case of complete atresia of the pharynx as the result of a thorough adenoidectomy and tonsillectomy before the Chicago Laryngological Society. Following the operation, the parents noticed that the boy did not breathe at all through the nose; they returned to their physician, and some adhesions were cut. When the patient was first seen by Dr. Jordan, two years before presentation, there was complete atresia.

Examination with the Holmes pharyngoscope showed the condition above the adhesions, and examination in the mouth demonstrated complete atresia. The child was taken to the hospital and given a general anesthetic, and the soft palate was freed from the postpharyngeal wall. A large heavy piece of dental rubber, stiff enough to keep the tissue well separated, and yet not stiff enough to cause sloughing at the angles of the wound, was placed between the soft palate and the pharyngeal wall, supported by two gauze strips brought out through the nose and tied, the nose being properly protected. The patient was able to swallow and to talk without any trouble. He was kept in the hospital for a week and then permitted to go home, still wearing the rubber. This was worn for three weeks more after which it was removed.

It has been exactly twenty-three months since this operation. There has never been any closure of the wound; the child breathes freely through his nose and articulates distinctly. As almost two years have elapsed, Dr. Jordan felt justified in reporting the case and bringing it before the society for observation.

TREATMENT

In the investigation of the coagulation time before tonsillectomy, Kleinert studied 645 cases. In only 435, however, was the blood clotting time recorded. It ranged from one to ten minutes. From this work it was concluded that there seems to be nothing gained by continuing the routine blood clotting time. It is important to consider age, contractibility of the tissues and the general physical condition of the patient. Clotting time beyond eight minutes must be comparatively rare, for in this study only one patient was found to require more than eight minutes.

In the description of a new technic for the ligation of vessels in tonsillectomy, Wells discussed the use of a special forceps which places a ligature in the tonsillar fossa.

Fineberg designed a combination tonsil forceps and tongue depressor. This is a combined instrument for enabling the operator to see and remove the lower pole of the tonsil.

Lewis also designed an adjustable mouthgag and tongue depressor.

Hurd described the control of hemorrhage by the use of salt pork. In nasal hemorrhage caused by a malignant condition, systemic diseases and rupture of vessels in the Kisselbach area, he stated that a piece of salt pork, 1½ inches (4 cm.) long and as large as the particular anterior naris will admit, is pushed into the nose until the outer end is well within the nasal vestibule. Usually he does not use any outside dressing to hold the pork in place, as it will slip out in a few hours and there is no more bleeding. However, he has had it remain in the nose as long as three days and be as clean when removed as it was when introduced. For secondary postoperative tonsillar hemorrhage, he places a small piece of salt pork in a tonsil sponge forceps and holds it gently against the bleeding area with just sufficient pressure to control bleeding. The time necessary to hold it in place is less than the clotting time of the patient. In severe tonsillar hemorrhage, he always ties the bleeding points and does not trust to any kind of clot-forming substance. Larding pork is cheap, common and superior to the usual nasal pack in that it is easier to introduce and is more comfortable for the patient, whose only complaint is that the salt causes smarting for a few minutes. Pork promptly stops the bleeding, and seems to have the property of preventing recurrence.

Nystrom reported the results of roentgen treatment of enlarged and infected tonsils. Seventy-four patients were treated by him in 1928. He usually treated the two outer fields, measuring about 5 by 6 cm., with one half of a Holzknecht erythema dose, copper filter of 0.5 mm. current of 2.5 milliamperes spark gap of 46 cm. and Coolidge tube. If necessary, the irradiation was repeated after an interval of six weeks, and in exceptional cases, three or four times. In the cases observed for from two to eight months, improvement was noted in thirty-two of the thirty-eight patients with chronic tonsillitis; decrease in the size of the tonsils was seen in two of four cases of simple hypertrophy of the tonsils in children, aged from 2 to 8. The author considered roentgen treatment in chronic tonsillitis best suited to patients with moderately enlarged tonsils with an uneven surface and crypts or pus plugs; in most of these patients, noticeable improvement was attained, often complete cure. With tonsils greatly enlarged but not yet infected, and in simple hypertrophy of the tonsils, as seen especially in children, roentgen treatment is advised only when operative treatment is contraindicated.

Following a recent discussion of the "tonsil problem of the aged" at a meeting of the Philadelphia Laryngological Society, "sensational notoriety" is said to have been given to a method of removing tonsils by electrocoagulation or desiccation which was advocated by a member during the discussion. The society has since passed a resolution stating that it does not officially endorse the method nor approve the publicity given the matter, and that it disclaims all responsibility for opinions expressed in the discussion on removal of tonsils by this method.

In 1921, Novak and Zeller reported the results obtained in a small series of cases in which the tonsils were coagulated at the Cook County Hospital. It was decided to study a series of 100 cases, but in only 7 was it attempted because of the results obtained. One case is reported in detail in which a portion of diseased tonsil was hidden in the scar following desiccation.

The procedure known as electrodesiccation of the tonsils was carried out by one skilled in the technic. A piece of diseased tonsil was covered by a fairly thick, smooth, white scar. The appearance of the throat some months later was such as to warrant a laryngologist in saying that there had been a complete removal of the tonsil. It may be said that portions of diseased tonsil was frequently left following surgical tonsillectomy. That is true, but it is only by electrodesiccation that such fragments can be so completely hidden from view.

In spite of the improvement which has been made in the technic of destruction of the tonsils by high frequency current, Novak and Zeller do not see any evidence of sufficient validity to change their opinion that the method is inadequate and unsatisfactory, and that it cannot in any manner compete with the accepted present day method of surgical tonsillectomy.

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Abstracts from Current Literature

Ear

THE SHRINKING PICTURES IN SHARPEY'S FIBERS AND COMMENTS ON MASTOIDITIS. WILFRED KRAINZ, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:364 (Jan. 7) 1929.

Krainz claims that shrinking of Sharpey's fibers and formations of empty spaces occur in both normal and diseased mastoid processes. Scheibe should be convinced that there are artefacts and that they do not represent a hitherto unknown resorption of bone. O. Mayer found that mastoiditis may lead to fatal complications, even during the first days, without particular changes in the bone; that the rarefaction of the bone may set in as early as the fourth day, and that mastoiditis is not equivalent to ostitis. Mayer claims that "mastoiditis" comprises alterative, exudative or proliferating phenomena in the mastoid process, which are defense measures. Krainz states that his investigations refer exclusively to mastoiditis occurring after acute genuine inflammations of the middle ear observed during eight years. O. Mayer's cases, he states, were observed during an epidemic of grip and followed a secondary inflammation of the middle ear observed during four months. Krainz understands a mastoiditis to be an irreparable inflammation of the mastoid process. Krainz did not operate because the bone was diseased, but because the clinical complex of symptoms demanded it. He always found changes in the bone with signs of insufficient release of pressure. He was not the first to claim, nor does he deny, that exudation in the pneumatic cells, edema of the lining, etc., are reparable, whereas O. Mayer does not care whether they can be repaired or not. Krainz claims that rarefaction sets in first in the vessel and marrow spaces. He does not consider the question as to where the impetus originates that causes increased pressure in the vessel system of the mastoid process which elicits osteoclasis. It is admitted that it can emanate from inflamed air cells. This explains why O. Mayer was obliged to operate for complications when no essential disease of the bone was present. These complications, as it is known, can occur by way of the paths of the vessels. In his early cases, O. Mayer found (besides hemorrhages and purulent exudation in the pneumatic spaces) perivascular infiltration and beginning vascular osteoclasis in the vessel channels. He does not consider these changes as an essential disease of the bone. Krainz looks on vascular osteoclasis as pathologic. O. Mayer thinks that mastoiditis is not an osteitis. He is correct. It is not an osteitis in a narrow sense. It is a disease of the whole system of the mastoid process, of the osseous structure and of the soft parts. The fiber skeleton of the marrow spaces, the vessel channels and the lining of the pneumatic spaces are identical in the development of endosteum. In the air cells, pneumatic epithelium is found. The fact that frequently two layers are found which line the cells does not allow one to think that the lining is a mucous membrane. It can be explained by the arrest of pneumatization. It is a chronic phlegmasia of the endosteum layers on which a new inflammation has supervened. O. Mayer's conception of mastoiditis is more comprehensive; his material was different, and his opinion concerning the essential disease of the bone differs from that of Krainz.

THE CERTAIN PROOF OF VASOCONSTRICTOR PROCESSES OF THE AUDITORY ARTERY DURING THE CALORIC IRRITATION OF THE LABYRINTH (A CONTRIBUTION TO THE VASCULAR NYSTAGMUS THEORY OF KOBRAK). O. MUCK, Ztschr. f. Hals-, Nassen- u. Ohrenh. **22**:443 (Feb. 16) 1929.

The author has repeatedly pointed out that the epinephrine-probe test shows the tonus of the innervation of the vessels of the brain. This nasal vasomotor reflex phenomenon, the so-called white streak design, demonstrates the hyperirritation of

the vessels of the brain. The author could show that in this instance a hyperexcitability existed of those parts of the sympathetic nervous system which innervate the vessels of the brain, while all vessels react with vasoconstriction on irritation of the sympathetic system. This reflex phenomenon was found invariably in migraine, hemicrania sympathicotonica. The author has made 15,000 investigations since 1922 and found that the phenomenon also occurs in the so-called Ménière's complex of symptoms. He states that this proves that vasomotor disturbances in the innervation of the brain vessels, especially of the internal auditory artery, play an important part, and that they are, probably, the exciting element in the so-called Ménière's disease. The internal auditory artery is an end-artery and serves the whole membranous labyrinth.

Muck drew the conclusion that the validity of the angioneurotic theory could be proved if his phenomenon, the epinephrine-probe reaction, could be produced in the healthy person after caloric irritation of the vestibular apparatus, provided a normal reaction was present before the caloric test. Repeated examinations proved the theory to be correct. Besides the vestibular nystagmus, the white streak design was always present. This also proves the correctness of Kobrak's vascular nystagmus theory. Further experiments had been made on a number of people with complete unilateral deafness and on deaf-mutes. If in patients with complete unilateral deafness and in deaf-mutes nystagmus could not be elicited, the vasoconstrictor nasal reflex phenomenon was also absent. The author again calls attention to his test with a few words. If the noninflamed mucous membrane of the nasal turbinal is sprayed with a solution of epinephrine hydrochloride 1:1,000 until a slight ischemia results, and if the mucous membrane of the lower turbinate is stroked several times on the same spot with a blunt probe, a reflex dilatation of the vessels occurs, as a rule. It can disappear quickly or it can last for several minutes (normal reaction). In diseased conditions (endocranial vessel sympathicohypertonia), after one or two minutes, and lasting longer, a sharply defined white streak or speck appears, when the epinephrine ischemia of the untouched mucous membrane begins to disappear. The author concludes: 1. If the labyrinth can be irritated calorically, greatly or slightly, the nasal vasoconstrictor phenomenon appears plainly. The white streak design is the symptom of an increased irritability of the vessels of the brain, in this instance of the auditory artery (experimentally induced angiospasm of the auditory artery). 2. In complete unilateral deafness, with a calorically unexcitable labyrinth, the white streak design is absent. 3. In complete deafness, especially in congenital deaf-mutism with calorically responsive nystagmus, the white streak design is present. 4. If the labyrinth of the deaf-mute does not respond to the caloric test, the vasoconstictor phenomenon of the white streak is not present when the labyrinth is irritated calorically.

AMBERG, Detroit.

EXPERIENCES WITH PRIMARY SKIN TRANSPLANTATIONS IN MIDDLE EAR CAVITIES ON WHICH RADICAL OPERATION HAS BEEN PERFORMED. J. TEMKIN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:467 (Feb. 16) 1929.

Siebenmann suggested Thiersch's transplantations in 1893. Denker, Passow, Reinhard and others used this method. These authors transplanted skin from ten to fourteen days after the operation. Immediate skin transplantations have been practiced at the clinic of the first University Hospital in Moscow since 1919. The author mentions the methods of others and states that in his clinic not the whole cavity is covered with skin but only certain parts, namely, the posterior wall of the antrum, the facial spur and the epitympanum. Of fifty-eight reexamined cases, thirty-seven (63 per cent) ran a smooth course, although sometimes excoriations and granulations were observed. In nine cases, the flap did not stick. In twelve cases, transplantation did not affect the course of healing. So far as a cure is concerned, Wittmaack stated that a complete final epidermization could not be obtained in more than 20 per cent of an immense number of cases. In Temkin's clinic, two unsuccessful cases were observed among forty-nine cases with transplantation of skin, and fifteen unsuccessful cases among fifty-nine cases

without transplantation or permanent attachment of the flaps. In thirty-seven cases of successful transplantation, the after-treatment lasted from three to eight weeks, averaging from thirty to thirty-five days; with unsuccessful transplantation, the after-treatment lasted from one and a half to six months, averaging three months. The author does not consider the transplanted skin a plastic material which must cover the cavity entirely but as a means which favors a quicker and easier propagation of the epidermis. As the success of epidermization is dependent on the character of the surface of the field of granulation, the most favorable conditions are found immediately after the operation, during the first days. The acceleration of the beginning of the process of epidermization is the most essential factor.

AMBERG, Detroit.

RESORPTION OF BONE IN ACUTE MASTOIDITIS. JAN GORNY, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**:482 (Feb. 16) 1929.

In order to investigate the pathologic processes of lacunary bone resorption and to examine the nature of the osseous substances, the author studied splinters of bone histologically. He took a piece of the compact cortex and of the spongious region of the antrum. The specimens were put in formaldehyde, were decalcified in nitric acid and embedded in celloidin. The sections of a thickness of from 5 to 10 microns were stained with Mallory's hematoxylin. Specimens were taken from nine patients with developed skeletons. In inflammations of the mastoid process, following suppuration of the middle ear, bone cells were present which showed not only alteration but also changes that were progressive, in all probability. Single giant cells have been found in osseous lacuna. These giant cells probably developed from elements of the body substance proper. Howship's lacunae might develop from giant cells which migrate from the osseous substance into the soft parts. The physiologic metamorphosis in the osseous substance takes its course through the medium of osseous cells. It is improbable that these react only with alterative changes during the pathologic process leading to their destruction. Some of the phenomena cannot be explained in this manner. The osseous cells are osteogenically equal to the osteoblasts. When it is assumed that giant cells develop from the latter, the possibility cannot be denied that they develop from osseous cells. Changes of the osseous cells are found not only at the height of the resorptive process but at the beginning of the same. They can be found without the common signs of destruction in the form of giant cells or Howship's lacunae. The latter may be the final stage of the whole process. Herein lies, principally, the importance of the active participation of the osseous substance in lacunary resorption. In looking for early signs of mastoiditis, not only should the lacunary resorption be investigated but also the cells and the matrix. One may perhaps search here for the primary change of the bone in mastoiditis.

AMBERG, Detroit.

Larynx

MODEL OF THE LARYNX. TONNDORF, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**: 464 (Feb. 16) 1929.

The author has constructed a model of the larynx which is 90 cm. high and is mounted on a table. A mirror is attached which allows a view of the interior of the larynx. The height of the model measured from the floor to the upper edge of the mirror is 2 m.

AMBERG, Detroit.

Miscellaneous

OPTIC NEURITIS. E. ESCAT, Ann. d. mal. de l'oreille, du larynx. **47**:1066 (Dec.) 1928.

Escat confines his report to cases of optic neuritis as distinguished from retrobulbar optic neuritis, in which the etiology of the lesion is obscure; he advises intranasal operation consisting of removal of the middle turbinate and opening of the sphenoidal sinus on the affected side.

He gives the report of eight cases, in three of which there was bilateral optic neuritis. In some of these cases the return of vision was greater than in others. The nasal pathologic process in some of the cases is not mentioned, and in other cases there was none seen.

The duration of the optic neuritis varied from a few days to one case of two months, another of four months, six months and ten months. The latter case showed no appreciable improvement.

The author's conclusions are that in every case of optic neuritis of unknown cause, in which syphilitic origin is not suspected, without prejudice to specific treatment and ophthalmologic therapy, rhinologic surgery is justifiable even in the absence of every manifest lesion of the nasal sinus.

Secondly, that the most simple operative procedure is the removal of the middle turbinate and opening of the sphenoidal sinus. The attack on the sphenoidal sinus by the orbital route should be reserved for the exceptional case in which there is excessive atresia of the nasal cavities. And finally, the therapeutic result is more favorable in proportion to the time of intervention which should be before the beginning of atrophy, but a partial or even advanced atrophy does not contra-indicate the operation, as a relatively excellent result may follow the surgical procedure.

HARRIS H. VAIL, Cincinnati.

NASAL OSTEOMA. H. BOURGEOIS, Ann. d. mal. de l'oreille, du larynx. **47**:1131 (Dec.) 1928.

The author presents a case which showed exophthalmos and outward deviation of the eye together with a tumor mass palpated on the internal wall of the orbit, and could be seen occupying the region of the middle turbinate on nasal examination.

The diagnosis from roentgen examination was osteoma The tumor was removed surgically. Vision of the eye was lost following the operation.

HARRIS H. VAIL, Cincinnati.

ISOLATED FRACTURES OF THE COCHLEA IN FRACTURES OF THE BASE OF THE SKULL. ARNOLD KLINGENBERG, Ztschr. f. Hals-, Nasen- u. Ohrenh. **22**: 452 (Feb. 16) 1929.

The author reports two cases of isolated fracture of the cochlea in fractures of the base of the skull. The clinical picture, general symptoms of a fracture of the base of the skull, absence of hemorrhage from the ear, dizziness, unilateral deafness and decreased caloric excitability of the vestibular apparatus of the same side show that an isolated fracture of the cochlea was present and not an isolated detachment of the cochlear nerve. The x-ray picture confirms the diagnosis. If a fracture line cannot be demonstrated, a diagnosis can also be made. The prognosis in regard to the function of the ear is unfavorable. Bone fissures can occur in the region of the labyrinth without ostensible signs of a fracture of the base of the skull. In these instances, the idea that a "commotio labyrinthi" is present is not justified.

AMBERG, Detroit.

Society Transactions

AMERICAN BRONCHOSCOPIC SOCIETY

Eleventh Annual Meeting, April 30, 1928

S. YANKAUER, M.D., *President, in the Chair*

Monday Morning Session, April 30, 1928

The eleventh annual meeting of the American Bronchoscopic Society, held in the Raleigh Hotel, Washington, D. C., convened at 9:30 a. m., Dr. Sidney Yankauer, president of the society, presiding.

DR. SIDNEY YANKAUER: In opening the eleventh annual meeting of the American Bronchoscopic Society, I have the honor to announce that we have with us today one of the honorary members of the society. It is not often that we have the pleasure to entertain one of our honorary members, and while we cannot exactly call him a guest because he is one of us, nevertheless his presence is a matter of note. To attempt to introduce Sir St. Clair Thomson would be superfluous, and to attempt to laud him would be futile. It is therefore impossible for me to make a speech of welcome. I can merely indicate his welcome presence here in plain New Yorkese, because anybody who has to speak when he is around has to look to his oratorical laurels, and therefore I shall merely express the hope that Sir Thomson will get up and say "how do you do" to us in real English.

SIR ST. CLAIR THOMSON, London, England: I think, Mr. Chairman, I would like just to limit myself to thanking you cordially and to saying that I am here with great pleasure, the first time that I have been able to attend as an honorary member. The last time I was a visitor, and I remember the warm reception I got from Dr. Arrowsmith who, if I remember correctly, was in the chair at that time, and the delightful time I had going back and forth from Brooklyn to New York.

As they say in Scotland, "Save your breath to cool your porridge," and I will save my breath for joining in the discussion, simply thanking you very much.

PRESIDENTIAL ADDRESS. DR. SIDNEY YANKAUER, New York.

At the beginning of the second decennium, the members of the American Bronchoscopic Society have every reason to feel proud of the progress which the art and science of peroral endoscopy has made. The true value of a retrospect, however, is to be found only when it points out the direction in which one must seek the character of future activity.

In Mt. Sinai Hospital, New York, the number of patients admitted for the diagnosis or treatment of diseased conditions of the lungs outnumbers the cases in which a foreign body is present in the proportion of ten to one. This does not correspond to the prominence in the literature which has been given to the work on foreign bodies, largely because the diagnosis and treatment in medical cases are not marked by the same *éclat*. So the value of bronchoscopy for these purposes has been slower to gain recognition, though the results are not less positive or less valuable to the internist and to the thoracic surgeon. As a result of previous experience it has become an established practice in our hospital to perform bronchoscopy as a routine procedure in any extensive operation on the lung, and I am convinced that the future of bronchoscopy will be characterized by its significance as a means of diagnosis, treatment and prognosis in diseases of the chest in general.

A review of my last 100 cases referred from the general departments of the hospital for determination of such data as could be yielded by bronchoscopic study showed five cases in which a foreign body was found at routine bronchoscopic examination for clinical diagnosis, though both history and roentgenogram were negative for foreign body. The group includes two cases of sarcoma and fourteen cases of carcinoma of the lung. Carcinoma is more commonly recognized by bronchoscopy, as in the majority of cases the lumen of the bronchial tree is involved. The bronchoscope brings the growth directly into view and makes possible the removal of a specimen for biopsy.

An exact diagnosis of the nature of extrabronchial masses making pressure on the trachea or bronchi cannot be made by bronchoscopy alone, but the location of the growth may be of valuable assistance in making a diagnosis. Enlarged mediastinal glands are most apt to make pressure at the lower end of the trachea or bifurcation, and their presence is characterized by broadening of the spur at the bifurcation or by shortening of the spur due to a broadening of its posterior half. Among other cases in this group were a considerable number of abscesses of the lung; two cases of benign tumors of the bronchial tree, hemangioma and papillomas; one case of congenital stenosis of the right main bronchus just below the opening to the branch of the upper lobe of the right lung; one case of pneumonoconiosis, in which the condition was diagnosed by the presence of an enlarged gland at the bifurcation of the trachea causing stenosis; two cases of ulceration of the trachea, one specific and one lupus; two cases of tuberculous granulomas with negative sputum and three cases of unresolved pneumonia in which the condition yielded to a short series of bronchoscopic treatments. That unresolved pneumonia should be cured by endoscopic treatment has not hitherto been brought out, and it is the duty of the bronchoscopist to convince the internist that early bronchoscopic treatment in both post-tonsillectomic abscess of the lung and unresolved pneumonia will greatly accelerate the spontaneity of the healing process.

In this series all cases in which tubercle bacilli were found in the sputum were excluded; yet in fifty-two cases, hemoptysis was a prominent symptom, occurring with about equal frequency in three types, namely abscess of the lung, carcinoma and foreign body.

Internists are usually fearful of bronchoscopy in a patient with hemorrhage, but experience has shown that unless hemorrhage is copious and frequent, the fear is unfounded. In the absence of tubercle bacilli in the sputum, hemoptysis is not a contraindication but an indication for bronchoscopy for investigation of the cause and treatment of hemorrhage.

It is evident that bronchoscopic study of obscure diseases of the chest yields a large mass of endoscopic evidence, some direct enough to establish diagnosis, while in other cases the bronchoscopic symptomatology helps materially to clarify the diagnosis.

This field of bronchoscopic work is only in its beginning, as a vast amount of research remains to be done, and a large field of usefulness is thereby opened to the bronchoscopist.

AN IMPROVED METHOD IN BRONCHOSCOPIC LIGHTING APPLIED TO THE JACKSON TYPE OF INSTRUMENTS. DR. CHARLES J. IMPERATORI, New York.

The original Jackson instrument is used, substituting a cystoscopic lighting attachment for the regular lighting arrangement. For instance, this full lumen esophagoscope was copied from this Jackson full lumen esophagoscope. The lighting attachment may then be substituted for the regular lighting attachment, which is this cystoscopic lighting attachment, the only difference in the esophagoscope or bronchoscope being the tip, which is a trifle more rounded.

This lighting attachment will not take the place completely of the Jackson lighting attachment for a great many reasons. This is simply a working model, and I hope at another meeting to show a better instrument.

The advantage that I have found in both bronchoscopy and esophagoscopy has been that with this type of lighting attachment one can see, as it were, around

the corner. It is rather delicate, and rather than pass it around, if there are any gentlemen who would desire to see this demonstrated, I shall be glad to show it to them at the end of the session.

AN INTRODUCER FOR IODIZED OIL IN LUNG MAPPING. DR. M. C. MYERSON, New York.

The feasibility and the safety of introducing various substances for therapeutic and roentgenographic purposes into the tracheobronchial tree have been recognized for a long time. The introduction of medicaments into the lower part of the respiratory tract for the treatment of diseased conditions antedates the use of opaque substances for x-ray purposes. About seventy-five years ago, Horace Green treated a large group of patients in this manner. Jackson first employed bismuth powder through the bronchoscope for mapping the bronchial tree in 1905. Later Lynah used bismuth in oil for mapping abscess cavities, and at about the same time Bullowa and Gottlieb mapped the bronchial trees of dogs with a bismuth and oil mixture during the course of their experimental work on the bronchial tree. Since the introduction of iodized oil 40 per cent by Forestier and Leroux, Sargent, Cottenot and others, the practice of bronchography has become a recognized phase in the diagnosis of many diseases of the chest.

When iodized oil was first introduced, the French workers used the intercricothyroid method of approach to the respiratory tract by means of a syringe and special needle. Then different clinicians began introducing the iodized oil through the bronchoscope. Jackson, Tucker and Clerf, Ballon and Yankauer were the proponents of this method. Others, principally Pritchard, have used laryngeal syringes and cannulas of special design. Mandelbaum and Kramer have used a special cannula much like the Mosher "Life Saver." The former has also employed a rubber catheter. Iglauer took advantage of the laryngeal intubation tube and has used this instrument for introducing iodized oil with considerable success. More recently Ochsner and Nesbit have demonstrated what they call the "Passive Method" of introducing iodized oil into the tracheobronchial tree. Their technic consists of having the patient aspirate iodized oil shortly after the pharyngeal structures have been anesthetized. Catheters are being used by several workers, but their methods of introducing the catheter vary somewhat.

I have been using a semiflexible tracheal catheter, known as the DeLee catheter, to the distal end of which is attached a metal bulb. The catheter slides readily over a stylet which ends in a slender handle, and has a typical laryngeal curve. After the larynx is cocainized, the instrument is introduced through the vocal cords, and the stylet is withdrawn. This leaves the catheter in the trachea with its proximal end protruding from the mouth. The patient is now told to close his jaws gently on the catheter, and he is permitted to walk about if necessary. He is then sent into the fluoroscopic room which may be close at hand or located in another part of the institution. The catheter being semiflexible is borne without discomfort and without restricting the movements of the patient's head and neck. The patient is then placed behind the fluoroscopic screen, and the iodized oil or bismuth in oil mixture is slowly introduced by means of a Luer syringe while the roentgenologist watches the chest. Before the introduction of the opaque substance, a few drops of cocaine solution are introduced into the trachea through the catheter so that the lower part of the trachea and the bronchi are more tolerant.

When it is desired to map the lower lobe of one side, the patient sits or stands behind the fluoroscopic screen, and the opaque substance is introduced with the chest tilted slightly toward the side which is to be mapped. If the lower lobe of the right lung is being mapped, tilting of the chest to the right side will cause the iodized oil or bismuth mixture to come into contact with the right tracheal wall and then work its way down into the right bronchus. An extreme tilting of the chest to a right angle which really means lying on the right side will cause the mixture to flow into the upper lobe of the right bronchus. For mapping the upper lobe the patient is placed on a table lying on the side to be mapped.

Lying on the left side will insure mapping of the upper lobe of the left lung, while lying on the right side will cause the iodized oil to find its way into the upper lobe of the right lung.

This method or technic for the introduction of iodized oil has the advantage of its simplicity together with the fact that the patient's breathing and comfort are not interfered with. There is no restriction of motion of the head and neck which rigid cannulas and intubation tubes necessitate. The results are satisfactory.

DISCUSSION

DR. SIDNEY YANKAUER: In regard to this instrument I want to say that at Mt. Sinai Hospital my co-workers and I have been using three different methods of introducing iodized oil. I have been using the intubation tube devised by Dr. Iglauer; Dr. Myerson has been using his own instrument, and the other associate, Dr. Kramer, has been using an instrument sold by Pfau and known by him as a "life saver." It consists of a bent tube with a laryngeal curve; it is a stiff tube and is introduced through the vocal cords. It is intended to replace an intubation tube in case of urgent dyspnea. This can be introduced and the iodized oil injected through that. The three of us have had about equal success in the injection of iodized oil, the chief element in the whole thing being the fact that the oil can be injected under direct guidance of the eye before the fluoroscope, and the patient can be placed in the optimum position; in this way not only can the iodized oil be directed to one particular lobe, but the quantity can be limited if necessary.

ANGIONEUROTIC EDEMA OF THE ESOPHAGUS. URTICARIA OF THE ESOPHAGUS. HERPES OF THE ESOPHAGUS. DR. CHEVALIER JACKSON, Philadelphia.

This paper is to be published in full in the ARCHIVES OF OTOLARYNGOLOGY.

DISCUSSION

DR. HARRIS P. MOSHER, Boston: I have always felt that one would find some anaphylactic phenomena back of the series of cases which Dr. Jackson presented. I am much surprised that anaphylactic tests were not made in these cases.

I would like to ask about the x-ray picture in the last case of ulcer of the esophagus. Does that show the type of cardiospasm that one would find in peptic ulcer?

DR. HENRY H. FORBES, New York: About six or seven years ago I had an experience which I think will be of interest. It was a most remarkable case of chronic pemphigus which lasted some years. The patient, a man, came to the Post Graduate Hospital with a history typical of that in Dr. Jackson's first case: He had been unable to swallow for thirty-six hours. The x-ray picture showed the same obstruction, and on examination of the esophagus the instrument could be passed down only a certain distance. Knowing the possible anaphylactic conditions existing, as Dr. Mosher said, one of the house physicians suggested the use of epinephrine. The patient was given 12 minims of the epinephrine hydrochloride, and within about fifteen minutes he could swallow as well as any one and although a second esophageal examination had not been made, a second x-ray picture showed that the column of bismuth went down in a perfect line.

SIR ST. CLAIR THOMSON: Some of these vague manifestations have been known to me for many years, and in England the title of "Quincke's edema" is used. I would suggest that it is rather useful to use a comprehensive term like that for these various manifestations until one is able to differentiate them from one another. Just as the term "septic sore throat" is used to cover acute edema of the larynx and pharynx and a number of the diseases which have similar symptoms, so here the term "Quincke's edema" is still used. I have seen these transitory edemas not only on the face and the eyelids, on the lips and inside of the cheek and the tongue, but also in the larynx. I have seen them appear and disappear, and I have never seen serious results. I generally treat them with arsenic and patience.

The question of the relationship of herpes to pemphigus is interesting. I have watched a few cases of herpes located chiefly in the fauces and in the larynx. In all the cases of pemphigus that I have seen (only about three or four) the patients have died; the condition has not appeared and disappeared although the lesions have improved. In pemphigus of the larynx the symptoms never disappear entirely, and it has taken sometimes two, and never longer than three years, to prove fatal. Perhaps my experience is limited, but still I fancy that in England there are perhaps as many patients with that type of disease as there are in this country. Perhaps I am rather an unsympathetic person, but I believe that these cases may be classified as the neurotic, the erotic and the tommyrotic.

DR. SIDNEY YANKAUER: The only cases of this kind that I can recall seeing, I saw during the stage when the esophagus was normal.

DR. CHEVALIER JACKSON: Replying to Dr. Mosher, four different roentgenologists in four different cities had made a diagnosis of cardiospasm. Dr. Manges recognized the presence of an anatomic narrowing which did not, for the time being, disappear and did not shift its location. After the lesions had healed, the esophageal wall was apparently in its normal place, and the lumen was normal. I omitted a number of details in regard to the last patient. She had herpes in a number of places on the body, of apparently the type of herpes febrilis. Under treatment by Dr. Mohler, which included rest in bed and cutting down the cigarets from about 150 a day to five or six, and the elimination of various other things that a neurotic person should not indulge in, she was apparently brought back to normal. She was sent home and her physician reported that she was well for a few weeks; then she developed a herpes zoster of the leg, which has had a prolonged and extremely painful course, followed by postherpetic pains such as those patients often have. In the pre-esophagoscopic days this condition would have been called cardiospasm. I think the suggestion of Sir St. Clair Thomson that these diseases all be classed together, until more is known about them, is excellent. That is why I have grouped them in this paper.

LUPUS OF THE ESOPHAGUS: REPORT OF A CASE. DR. FORBES.

This paper was published in full in the April issue of the ARCHIVES, p. 441.

DISCUSSION

DR. HENRY B. ORTON, Newark, N.J.: If Dr. Forbes has investigated and cannot find any cases on record, the nearest that I can get to it is lupus of the epiglottis.

The only two questions I might ask Dr. Forbes are: (1) whether an x-ray picture was taken of the chest, and (2) whether a specimen was removed from the esophagus? This case has been extremely interesting and is worthy of reporting.

DR. HENRY H. FORBES: An x-ray picture was taken about a year and a half before presentation. I took none at the time.

As to this question that Dr. Orton raised, Dr. Imperatori brought up the same point, as to whether I have taken a specimen. I have been loath to do a biopsy in esophageal lesions of the superficial type. I think that this procedure is essential both in esophageal work and in laryngeal work when there is a thickened membrane, but with an ulceration of this type when the membrane is so thin in the esophagus and the proper instrument is lacking, I felt that I was not justified in doing a biopsy. On the other hand, I feel justified with the history obtained. With the evidence present on the nose both internally and externally, and in the soft palate, one must really consider this a case of lupus, and I trust that the members may do so.

I observed an unusual case only a few days ago, a case of lupus of the hypopharynx in which the condition was extremely low down in the pharynx. The patient, a boy, had a similar history of the sticking of the food, which, by a little coaxing, he would be able to swallow.

POUCH OF THE ESOPHAGUS. DR. HARRIS P. MOSHER.

This paper appears in full in this issue, p. 547.

DISCUSSION

SIR ST. CLAIR THOMSON: Of course I am here to learn, but still I must be a little critical, without being too much of a literary purist. This pouch was not in the esophagus; it was in the pharynx. Perhaps I am rather straddling because I have been jumped on for describing this in my textbook as the "Pharyngeal pouch" and yet I described it under "diseases of the esophagus." This was done on purpose because, of course, the symptoms are chiefly esophageal, although anatomically and pathologically these pouches originate in the pharynx by a splitting between the muscles.

Having "cleansed my bosom of this perilous stuff which weighs upon the heart," I will only stop to say that in case physicians in this country have not had similar experiences, I should like to warn junior members of the dangers and disasters from poking esophagoscopes into pharyngeal pouches. First of all, there is no need to do so. With the use of x-ray pictures, one can make the diagnosis. There are some thrusters, however, who are not satisfied unless they poke their instrument everywhere, and if they go poking it into pharyngeal pouches, they will meet with disasters, as the pouch wall consists of only the mucous membrane and the aponeurosis on the outside; there is no muscle and the slightest movement of the patient may lead to perforation. Therefore, I should just like to say a word of warning about it.

ROENTGEN OBSERVATIONS ON SAFETY PINS AS FOREIGN BODIES. DR. WILLIS F. MANGES, Philadelphia.

This paper was published in full in the March issue of the ARCHIVES, p. 245.

DISCUSSION

DR. CHEVALIER JACKSON: There are more problems connected with the safety pin than that of disentanglement and removal. For the study of all those problems the roentgenologist is consulted. We want him to tell whether there is a clamp at the end of the pin, whether or not the pin is mutilated or imperfect, or whether it is so corroded that it will fall apart when touched. We want to know if there is any foreshortening; if so, he makes other studies for us in the plane of greatest expansion, so that we know exactly how far the point is from the keeper. He can tell us the exact size of the pin, and match a duplicate for us. But in addition to this roentgenologic information, Dr. Manges has contributed many important suggestions for the solution of the mechanical problem. I cannot sit down without referring to Dr. Manges' work with the double plane fluoroscope in connection with the safety pin, which, of course, is the only topic germane this morning. We used to close safety pins with a modification of the Mosher safety pin closer. We also used a modification of the Mosher slot bronchoscope with the Tucker grasping forceps. In at least one half of the cases (and probably more) observed by us, the safety pins are now closed. The Arrowsmith closer was splendid, but did not fix the pin; the pin would rock around so that it was exceedingly difficult to get the closer placed on both branches. Dr. Clerf added a fixing wire to the end of the cannula and now, with the aid of Dr. Manges and his double plane fluoroscope, the Clerf-Arrowsmith closer solves the safety pin problem in many of the cases in which we decide to close the pin. Closure, however, is not suited to certain cases, about half the total number. Closure requires the double plane fluoroscope and especially the double plane fluoroscopist.

Dr. Manges referred to the case of the four safety pins, the problem of the Gordian knot that could not have been cut. Almost anybody can cut a knot. With the aid of Dr. Manges I was enabled to untie that Gordian knot in an infant 9 months old. If any one wishes to know what the difficulties are, take the film of an infant 9 months old and put your fist over it. Your fist will cover the film

of the infant's thorax, and in that space we had to work with those four safety pins plus the bulk of the necessary instruments. The aid of Dr. Manges was essential.

DR. LYMAN RICHARDS, Boston: May I mention just one point from the prophylactic side of this question? I have recently been shown a safety pin by a pediatrician in which there was a transverse wire bar annealed to the middle of the pointed shaft of the pin, and it was claimed that it would be absolutely impossible to swallow that pin. I immediately stated that mothers would find such a pin cumbersome and would refuse to use it, and the reply was that the pin had been submitted to mothers who, on the contrary, found the bar rather helpful in holding the pin as it tended to prevent side play while being used.

DR. H. P. MOSHER: I cannot say anything in commendation of the paper any more than Dr. Jackson said. It is a very splendid paper. I should like, however, to speak to one point. In our part of the country we are still using the safety pin closer, but I think that if the two are used, one will be absolutely sure of the size of the keeper. Unless one knows the size of the keeper and knows that that keeper will go into the tube, the tube should not be used.

Dr. Jackson has been quietly sidling up to the use of the fluoroscope. I believe that all metallic bodies in the esophagus should be removed by the joint efforts of the roentgenologist and the esophagoscopist.

DR. RICHMOND MCKINNEY, Memphis: I should like to ask Dr. Manges his estimate of the percentage of safety pins that would be obstructed on their passage out from the intestinal canal after passing the pyloric end of the esophagus of the stomach. I have never seen one stop after it passed into the stomach.

DR. WILLIS F. MANGES: To answer the last question, as to the percentage of pins that are obstructed after passing the pylorus, I know of only two cases in which pins had to be removed surgically. One was a closed safety pin lodged at the duodenojejunal junction. The child was kept under careful observation for about twenty days. There were absolutely no signs of any disturbance, but at the end of that time Dr. Jackson felt that it was time for it to come out. The patient went to another institution and had it removed. The second was a closed safety pin that lodged somewhere near the same site. The pylorus is the first and the duodenojejunal junction the second angular point which the foreign body must pass. Straight pins and needles have been removed surgically from these locations, but only two safety pins that I recall now have required open operation for their removal. In most cases large, open safety pins go through and pass.

In the infant 9 months old who had the four safety pins in the esophagus, one smaller than the other, two passed through the intestinal tract without any difficulty. It is a question as to whether any of them would have been discovered if it had not been for the fact that the child passed an open safety pin in the hospital while waiting for an operation for an entirely different ailment. When the first pin was passed, it was decided to make a roentgen examination, and the other four were then found in the esophagus. Two of these passed.

DR. CHEVALIER JACKSON: In the two cases in which Dr. Manges said that the safety pin was removed surgically, he meant from the abdomen. None has ever yet been removed at the Bronchoscopic Clinic from either the thorax or the esophagus.

ENDOSCOPIC TREATMENT OF PULSION DIVERTICULUM. DR. CHARLES J. IMPERATORI.

This paper was published in full in the March issue of the ARCHIVES, p. 266.

DISCUSSION

DR. H. P. MOSHER: Last year when this subject came up I gave my experience with the procedure for the treatment of a pouch, saying that I had had a number of cases in which pouches were present, that I had cut them all, and

that I ended the procedure when the last patient, the seventh, succumbed. I think I mildly hinted that one could not accept this procedure of Dr. Imperatori's until one had had further experience with it, describing a near calamity which I had had from the inversion of the pouch. Now he has had his further experience; it is in line with mine; he has been honest and frank enough to give us his experience, and I feel that he and I will go on record as putting on record an historical observation.

Dr. Louis H. Clerf, Philadelphia: This method of endoscopic treatment has never been tried at the clinic. Recently Dr. T. A. Shallow and I have introduced a method to prevent recurrence in cases of pulsion diverticula in which the patients were operated on by the combined method of Jackson and Gaub. It had been noted that in laryngectomized patients in whom the anterior attachment of the cricopharyngeus muscle had been cut there was no difficulty in swallowing, although there was no longer an upper constrictor of the esophagus. It was therefore decided to cut completely the cricopharyngeus muscle at its origin on the side of the operation. This has been done in three cases, one of them a case of recurrence.

Roentgenologically, there was normal function; esophagoscopically, nothing unusual was noted.

It is too early to draw any conclusions regarding this procedure.

Theoretically, this method should be successful in preventing a recurrence, especially since operation simply removes the diverticulum and probably in no way influences the underlying factors which are operative in producing the sac.

Dr. Sidney Yankauer: I want to say that I have performed Dr. Imperatori's operation in one case. I had no difficulty in inverting the sac, although it had existed for a long time. I had a little trouble tying the sac off because I introduced the loop outside of the esophagoscope instead of putting it through on the inside. I did it that way because I thought I would get a better grip on the inverted mass. Twenty-four hours after the operation, however, the patient had a chill, an elevation in temperature and developed an acute septic enteritis with marked diarrhea and prostration; two days later he died. Fortunately, an autopsy was permitted. The autopsy confirmed the diagnosis and the cause of death as an acute enteritis. I examined the esophagus on which the ligature had been placed, and I found an infiltration around the site of the ligature and a sufficient exudate of the tissues to, in all probability, have prevented any extension of any septic process that might have taken place; in other words, if this patient had not developed an acute enteritis, the local condition in the esophagus and surrounding the esophagus was such that one could have expected a successful outcome.

From the appearance of the peri-esophageal tissues, I would not hesitate to attempt this operation again, and I am not yet as thoroughly convinced as is Dr. Mosher that the operation is to be called an historical one.

Dr. H. P. Mosher: In the case that I recorded there was a turning out of a pouch with an immediate embolic empyema, with the usual sequelae, followed by an abscess of the liver. I am praising Dr. Imperatori to the limit of my ability for his frankness in this matter. I do not agree that the walling off was of the innocent type described.

Membranous Laryngitis and Tracheitis with Staphylococcus Aureus-Hemolyticus Infection. Dr. Gordon Berry, Worcester, Mass. (This paper was published in full in the Annals of Otology, September, 1928.)

This case is unusual because of the type of infection and its manifestation as an abundant suppurative infection of the respiratory tract.

This patient had no history of previous chronic infection of the upper respiratory tract; had the usual diseases of childhood; two normal pregnancies and was eight months in the third pregnancy which had been normal, except for some nausea and a somewhat troublesome cough.

April 14, 1928, she developed a slight hoarseness with general prostration; the temperature was 100 F.; the pulse was rapid; the chest was clear except for a few râles at the base of the left lung. Urinalysis showed urates and a trace of albumin, but no casts or blood.

The temperature and pulse rate were normal in twenty-four hours, but the patient was kept in bed because of the hoarseness and the condition of the kidney. During the night, dyspnea of an asthmatic type developed; became rapidly worse and at 2 a. m. the patient was admitted to the obstetrical ward in great respiratory distress, both inspiratory and expiratory; the temperature was 101 F.; the pulse rate 120, and respirations 30. This condition was somewhat relieved by morphine and epinephrine hydrochloride hypodermatically and ephedrine by capsule.

Local examination showed a crusting pus in the nose and throat, a thick, dirty, brown membrane or crust covering the vocal cords, affording only a small vent in the middle through which the patient breathed with difficulty. Dislodgment of two large casts about the size and shape of the third digit of a man's little finger gave immediate respiratory relief, though examination showed annular crustings still adherent to the tracheal wall lower down. Although smears did not show Klebs-Löffler bacilli, 10,000 units of antitoxin was given, without effect. Administration of ammonium chloride helped by loosening the secretions.

Following delivery of a live eight months' baby, culture of placental blood as well as of venous blood was negative for growth. Twenty-four hours after delivery the temperature rose to 102.6 F. I removed more crusts from the larynx and trachea, injecting 10 cc. of liquid petrolatum into the trachea. On two successive mornings, I injected 5 cc. of iodized oil into the trachea, after which the patient was able to dislodge the tracheal casts herself. She developed pleurisy and bronchopneumonia with the temperature elevated to 105 F. but remaining about 103 F. throughout the illness. Crusts became soft and moist so that she could cough them out, and there was no return of the respiratory distress other than that caused by the pneumonia. The patient died six days after delivery and eight days after the onset of the illness. Autopsy could not be obtained.

I recovered streptococci and *Staphylococcus aureus* and later laboratory investigations revealed *Staphylococcus aureus-hemolyticus*, but no Klebs-Löffler bacilli. The question naturally arises as to whether it was *Staphylococcus aureus-hemolyticus* that caused the membranous manifestation or the accident of a coexisting pregnancy.

DISCUSSION

DR. CHEVALIER JACKSON: I should like to ask Dr. Berry if there was any sign of atelectasis, any sign of obstruction and whether or not there was obstruction to both bronchi. In one of our cases an infant, Dr. Clerf did seventeen bronchoscopies for removal of crusts that were obstructing both lungs at the bifurcation. The crustings after a time ceased to reform. I do not recall what the bacteriologic observations were in that case. The persistent crusting, however, created a mechanical obstruction in the tracheobronchial airway that threatened asphyxia seventeen times. The patient recovered but would have died of suffocation if those crusts had not been removed. In these cases when the breath sounds diminish over both lungs bronchoscopy should be done to determine whether or not crusts at the bifurcation are obstructing both main bronchi.

DR. M. C. MYERSON: About two weeks ago I had two cases within seven days of each other which were similar to the interesting case of Dr. Berry.

As we know, the severe influenzal infection of the respiratory tract is of hemorrhagic character, and in this infection the trachea and bronchi partake of a necrotizing process; there may be superficial or deep ulceration, and when we have this type of ulceration, we are likely to have exudation.

The first case was a woman, aged 28, who was pregnant and in severe respiratory distress. The diagnosis at the hospital was tracheal diphtheria. I passed a bronchoscope down through the vocal cords and found that the larynx was patent,

that the vocal cords and all the structures were exceedingly dry and that there were some superficial abrasions. The lower end of the trachea was completely occluded by a collection of crusts, and whatever air the patient was getting was coming through the interstices among these crusts. With large size suction tubes and forceps, these crusts were removed, and many were removed from the larger bronchi which were completely occluded. We could see a severely reddened mucous membrane with many ulcerations of rather small size, and we could see superficial and moist exudate attached to some of these ulcerations. The left main bronchus was completely clear. The patient had a temperature of 105 F. before I left the hospital and died the next morning. Although no autopsy was obtained, it was felt that we were dealing with a case of influenzal tracheobronchitis.

Seven days later a woman, aged 19, seven months' pregnant, came into the same hospital with severe laryngeal dyspnea. Direct laryngoscopy showed a hemorrhagic mucous membrane with many superficial crusts. The crusts were cultured and the report came back of the presence of the Klebs-Löffler bacillus. The patient was transferred to the Willard Parker Hospital. Three days later she was still alive and apparently doing well. I do not know the final outcome in this case.

There seems to be a predisposition on the part of pregnant women to lesions of the respiratory tract with crusting. The explanation is not known.

Dr. W. A. Hudson, Detroit: I just had a final report on a patient whom I saw about two months ago. She was admitted to the hospital with extreme dyspnea; both inspiration and expiration were labored when I was called to see her, it had been suggested that an intubation be performed. There had been a pure culture of staphylococcus from the laryngeal walls, and indirect vision of the larynx revealed a much swollen laryngeal structure. Intubation was followed by some temporary relief. The intubation tube was expelled, to be replaced a second time. The relief was not sufficient; she was cyanotic, and it was evident that she was in a moribund condition. A hasty tracheotomy was done, what is spoken of as a low tracheotomy, and an adult tracheotomy tube was inserted. There was immediate relief; the patient's color improved and she was comparatively comfortable. She was discharged from the hospital ten days later with a clean wound. During the interval that she was in the hospital it was found that there were casts and much pus in the urine. The lungs remained clear throughout, and the cardiac mechanism remained normal. I saw the patient two weeks ago; she had an entirely clean wound, and one week ago was delivered of a full-term baby boy.

Dr. Lyman Richards: I saw one similar case in which the larynx alone was involved. The patient was admitted to the hospital in diabetic coma, which was relieved by insulin, but complicating that was this dry condition in the larynx producing a high degree of dyspnea. This was successfully treated by intubation.

Dr. Gordon Berry: The delivery of the child, of course, eased the respiration considerably. I inquired particularly as regards the possible choking at the last, and the house officer replied without hesitation that there was no choking at that time. The presence of the excessive secretion added to the burden. Death came at 3 a. m. while I was not there; however, I do not think that any bronchoscopic effort would have served. She was swamped with pneumonia at that time. I have wondered whether there might be some connection between the pregnancy and the formation of membrane.

I am much interested in Dr. Myerson's two cases. This was not a diphtheria. In my experience there have been three cases with a nondiphtheritic membrane (two were in the ear and one was in the nose) in which antitoxin was given. All of the patients gained materially, and it was on the strength of these results that I strongly recommended the administration of diphtheria antitoxin in this case. But there was no relief; the crusts did not loosen until either the pneumonic process or the secretions gained by the use of ammonium chloride, loosened them.

The meeting was adjourned at 12:15 p. m.

Monday Afternoon Session, April 30, 1928

The meeting convened at 2:35 p. m., Dr. Sidney Yankauer, president, presiding.

CONGENITAL ATRESIA OF THE ESOPHAGUS WITH TRACHEO-ESOPHAGEAL FISTULA. DR. W. LIKELY SIMPSON.

This paper was published in full in the March issue of the ARCHIVES, p. 267.

DR. THOMAS E. CARMODY, Denver: I think I am distinctly well qualified to open this discussion because I have never seen a proved case of this kind. I saw a postmortem specimen of this kind, and I had one case in which I believe the condition was the same. The child died of a pneumonia as in Dr. Simpson's case, but I was unable to obtain a postmortem examination and thus could not prove the diagnosis. I think Dr. Simpson was especially unfortunate in seeing these cases, especially unfortunate in seeing three children die within ten days of something for which he could do practically nothing. He was especially fortunate in being able to make the postmortem examinations in order to be able to prove his diagnosis.

The fact that he found no other malformations is of interest to me, as I have been interested in malformations of the upper ends of the esophagus and respiratory tract for a number of years, and it is peculiar that, as a rule, we find only one malformation. For instance, we find only one malformation such as a cleft palate or a cleft lip, but we do not find a malformation of the esophagus, larynx or any other part of the body in the same case. There are a few cases on record in which clubfeet and cleft palate occurred in the same subject. These cases are interesting in connection with the work of Mosher on stenosis of the esophagus and the work done on stenosis of the pylorus. These cases are interesting from the anatomic standpoint, while these cases which Dr. Davis has presented to us are of great interest from the clinical standpoint because of our work in bronchoscopy and esophagoscopy.

I wish to compliment both Dr. Simpson and Dr. Davis for their interesting papers.

ANATOMIC VARIATIONS OF THE NORMAL TRACHEOBRONCHIAL TREE. DR. J. DWIGHT DAVIS.

This paper was published in full in the April issue of the ARCHIVES, p. 404.

DISCUSSION

DR. PORTER P. VINSON, Rochester, Minn.: Dr. Davis has not told us about the tremendous amount of painstaking work that this study entailed in the preparation of mediums, the injection of specimens removed at necropsy, and of the hours of tedious labor in tracing the roentgenograms of the injected specimens.

This work is of great significance to those of us who are interested in bronchoscopy. In beginning bronchoscopic work one has certain preconceived ideas of how the bronchi will appear and is more or less chagrined when introducing the bronchoscope not to be able to identify the structures that have been so carefully pointed out as normal. In attempting to locate disease, particularly in the middle lobe of the right lung, it has not been possible to identify the bronchus to this lobe. Dr. Davis' work, of course, explains this difficulty. In anatomic studies, it is impossible to show the details of the bronchial tree which he has demonstrated in these tracings.

DR. LOUIS H. CLERF: This has been an interesting presentation, and I wish to compliment Dr. Davis on his good work. One of the most frequently observed variations in our experience, is the giving off of the upper lobe of the right bronchus, the apical branch. Not infrequently its orifice is observed on the right wall of the trachea at about the level of the carina.

Recently we examined bronchoscopically a case of transposition of the viscera. The usual distribution of bronchi on the right side was found to be present on the

left side and vice versa. Subsequently, pneumonographic studies were made, and these corroborated the original observations.

Dr. W. B. Chamberlin, Cleveland: The only case of congenital abnormality which I encountered was entirely by accident. It was a case which I saw in consultation. The child was brought to the hospital with a peanut in the left bronchus. It died before a bronchoscopy could be performed. We found on autopsy a congenital absence of the right lung, the main stem of the right bronchus ending in a blind pouch. I cannot remember whether there was any vestigial lung tissue or not; but this child got the peanut into his only bronchus and lived a short time, because there was opportunity for the passage of a relatively large amount of air. The child was about 4 or 5 years of age.

The only case of tracheobronchial fistula which I have seen was not congenital. It occurred in a man and was due to syphilis. The patient was fed for a long time on liquid food through a tube. He was put under antisyphilitic treatment and ultimately recovered.

Dr. Sidney Yankauer: I should like to describe the case of congenital stenosis which I mentioned this morning. The patient, a man, had had a cough all his life, and a year or so before he came under our observation, following a cold, he began to expectorate large quantities of foul-smelling sputum. When we examined him bronchoscopically, we found that the spur at the division leading to the branch of the upper lobe of the right lung was excessively large, so that it extended into the lumen of the right bronchus, converting that lumen from a round opening into an elliptical opening with the long axis vertical. On the opposite side of the bronchus there was a corresponding web, but it was comparatively shallow. The shape of the lumen of the bronchus was that of a pointed ellipse. Below that the bronchus was dilated and contained purulent secretion. There was no possible explanation for this condition except a congenital malformation.

I was waiting for Dr. Davis to describe one branch of the bronchial tree which I have not seen described, but which from the clinical point of view seems to me to be an important one, and that is the branch which comes off from the posterior wall of the right main bronchus just above the division into the branches of the lower lobe. This bronchus is present rather frequently even in normal patients, but it is particularly the seat of purulent secretion in cases of abscess of the lung, and I have found that quite a few abscesses of the lung are in portions of the lung fed by this one posterior branch; at least in one of the patients that I have cured the abscess has been in this location. It is a branch which is probably particularly prone to infection, because it comes off from the posterior wall and consequently, especially during anesthesia and operative procedure, would be the one to catch anything that was inhaled.

I have frequently demonstrated this posterior branch to those who have watched me examine patients with a bronchoscope, and it would interest me to know whether Dr. Davis has paid any particular attention to that region.

Delayed Exitus in a Case of Esophageal Cancer. Dr. Joseph C. Beck.

I think this whole presentation might be delayed for good, so far as its life saving value is concerned, but I am responding to the secretary's invitation to present something before this society, and as I was much interested in this case, I chose to bring it before you for discussion.

The subject of esophageal cancer, I suppose, has interested me because of the fact that so little can be done in these cases. Another point that has interested me is the experimental work that I have followed since Professor Carrel and Dr. Carl Beck in Chicago made some investigations and performed some operations on making a new esophagus outside of the body; that is, on the anterior part of the body. Following the work of the great Michulitz, who himself succumbed to this disease, and then his pupils, especially Sauerbrüch, and the late contributions from New York by Dr. Willy Meyer and Dr. Torek, it seems that there is a more hopeful attitude regarding esophageal cancer if a patient, such as mine, can

be kept in the condition in which she was maintained for two years and seven months from the time that a diagnosis was made of a probable esophageal carcinoma, and two years and two months from the time that a biopsy was made of a squamous cell carcinoma.

Another point that interested me was that while in Kioto, Japan, about five or six years ago, I witnessed an operation for carcinoma of the esophagus wherein the laryngologists (who perform their operations for gastrostomy themselves) were operating on a man who had this disease. They did a laparotomy and then closed the wound without performing the gastrostomy. On inquiry, I was told that there were some glands found in the mesentery and therefore the case was hopeless. They therefore closed the wound and said the sooner the patient died the better. Of course, we in this country do not assume that attitude in the treatment of cancer, even though it is as hopeless as one with involvement of the mesentery gland.

Fig. 1.—A patient in whom a biopsy showed esophageal cancer.

My patient was 61 years old, and the diagnosis of esophageal cancer was made after the biopsy. The fluoroscopic as well as the radiologic examination showed that the cancer was located in the upper part of the esophagus posterior to the cricoid; so the patient was subjected to roentgen treatment in that region. I have never seen just such a response to deep roentgen therapy as this patient showed after one course of treatment. Two weeks after the treatment was completed, the patient called me up and said that she was able to swallow soft food, whereas previously she had had great difficulty in swallowing even the smallest amount of liquid or water. This improvement in swallowing increased so that she was able to swallow soft food for almost a month without any difficulty. She was gaining in weight, and I was much interested to see what was going on inside the esophagus but was not permitted to do an esophagoscopy. Fluoroscopic examination, however, showed a free passage, a free esophagus.

After a month the patient began to complain of obstruction and within two or three weeks showed marked symptoms of obstruction. I again passed the esophagoscope and found that there was practically a complete closure as seen through the tube. The patient was again subjected to roentgen treatment, but this time the response was not the same; in fact, there was little if any benefit. On the contrary, the patient developed marked symptoms of hypothyroidism, and was benefited by feeding thyroid. She then required gastrostomy which was performed by a general surgeon. The response following this procedure was, as usual, beneficial, and to our great surprise, or rather gratification, the patient was able to swallow milk and all liquids without much difficulty. Solids were not swallowed so easily, however. She continued in this condition for more than a year when she developed respiratory symptoms but not symptoms of a blockage of the respiratory tract from tumor. On examination, we found at first a paresis and then a marked paralysis, bilateral abductor paralysis, so that a tracheotomy was performed.

The accompanying figure shows the patient after the tracheotomy and gastrostomy were performed. She died from symptoms of exhaustion; however, there were no symptoms of pneumonia or mediastinitis. I was not permitted to make a complete postmortem examination but was allowed to examine with the esophagoscope. I found that the tumor had involved the sides of the neck so that one can readily understand the development of the bilateral abductor paralysis.

When Dr. Simpson presented his cases, he said that he felt something would be done in the future in this manner and I feel that while perhaps it is not within the province of this society to discuss operations of a new esophagus, yet in the light of the hopelessness of carcinoma of the esophagus, I thought I would present this case for discussion. I have had considerable experience and have seen a good many cases of carcinoma of the esophagus and, of course, as I said, so far the condition is baffling to us.

DISCUSSION

DR. CHARLES J. IMPERATORI: May I ask Dr. Beck whether or not a gastrostomy was done eventually?

DR. JOSEPH C. BECK: I showed the picture as gastrostomy and tracheotomy.

DR. CHARLES J. IMPERATORI: All of us have had cases of this kind from time to time. I would appreciate it if Dr. Beck would give us some suggestion as to what type of case is most suitable for a gastrostomy. The Japanese point of view is one extreme, while some do a gastrostomy in every case. Usually in each case we are sorry regarding the outcome, and any suggestion would be of help to me and perhaps to the others.

DR. W. F. ZINN, Baltimore: I was much interested in Dr. Beck's case. I have had between seventy-five and one hundred cases of carcinoma of the esophagus. One man, having a squamous cell carcinoma, on whom I did a gastrostomy, has gotten along well for the past eighteen months, with little loss of weight and has been able to look after his business. He lives seventy-five miles from Baltimore and comes up about every two months. I have used the esophagoscope once or twice since, each time removing a small specimen which has also shown the squamous cell carcinoma.

I feel that one of the difficulties is that the older teachings give the symptoms of carcinoma of the esophagus as water hunger, loss of weight and dysphagia, and all of these are extremely late symptoms occuring during the course of the disease.

If we hope to do anything we must get these cases much earlier, before they have any of these grave symptoms. Because of a late diagnosis, things have not progressed as they should have.

So far as treatment with roentgen ray and radium is concerned, I have not seen any benefit derived therefrom in probably twenty cases. If cases of carcinoma of the esophagus are seen early in the course of the disease, a gastrostomy affords more relief and less discomfort than anything that we have tried. In almost all cases of proved carcinoma of the esophagus, even though the condition is in an

extremely early stage, I advocate a gastrostomy before the patient begins to lose weight and go downhill, as little good may be done in late stages.

DR. JOSEPH C. BECK: I would say that a permanent esophageal tube used from time to time would not relieve the condition so that the patient could be fed.

As Dr. Zinn said, the earlier the gastrostomy, the better in every case. My point was that the gastrostomy should be done to feed the patient and maintain nutrition until the operation can be performed. The experimental operation or surgical intervention for the removal of the cancer could be performed by operation on the chest with either positive or negative air pressure; that is, in a vacuum air pressure. The reports from abroad are flattering. In this country we do not hear the best reports. A gastrostomy is only a temporary operation, but when one sees these patients suffering from hunger as well as suffocation, it is one's duty to use temporizing measures.

BENIGN NEOPLASMS OF THE BRONCHUS: REPORT OF A CASE OF BRONCHOSCOPIC REMOVAL OF A FIBROLIPOMA FROM THE LEFT MAIN BRONCHUS.

TUBERCULOSIS OF THE BRONCHUS FOLLOWING ABSCESS OF THE LUNG AFTER TONSILLECTOMY. DR. M. C. MYERSON.

The first mentioned article was published in full in the April issue of the ARCHIVES (p. 376); the other article appeared in Am. Rev. Tuberc. **19**:201 (Feb.) 1929.

DISCUSSION

DR. PORTER P. VINSON: I should like to ask Dr. Myerson if there was an opportunity for examining the tonsils for tuberculous infection. We observed the case of a girl who developed a pulmonary abscess after tonsillectomy which was done elsewhere. This abscess proved to be actinomycotic in origin. We did not have the proof that the tonsils showed evidence of actinomycosis, but we assumed that such was the case.

I feel that those of us who are doing bronchoscopy for diagnosis should always think of tuberculosis, particularly if we see a lesion that involves the upper lobe, and I am convinced that if we are reasonably sure that tuberculosis exists, it is unwise to use a bronchoscope on these patients. I have seen one or two instances in which it seemed that we hastened the spread of the lesion by bronchoscopic instrumentation.

DR. CHARLES J. IMPERATORI: The point brought out by Dr. Vinson regarding tuberculosis is important. In the thesis that I read when admitted to the American Laryngological Association several years ago, on "The Treatment of Lung Suppuration by the Endoscopic Method," I had in that series of cases, twelve cases of abscesses of the lung, and I was fortunate in being able to procure four autopsies. In these cases irrigation, aspiration and insufflation had been done persistently by the use of an oily bismuth solution. These four patients all showed tuberculosis in the periphery of the abscess, and I began to feel that in a great many of these cases the fatal outcome was hastened by our persistent efforts, and I also arrived at the conclusion that in a great many of these cases, in which the patients were considered to have chronic abscess of the lung, the condition was tuberculous.

Regarding the first case of Dr. Myerson's, the benign tumor of the bronchus, I have never seen a case of this kind. About seven years ago I saw a case with what I thought was a fibroma, but on removal, it proved to be a carcinoma. I reported that case before the Academy of Medicine, and I was fortunate in having Dr. Ewing of Cornell University do the autopsy, and that was a carcinoma on a tubercular base. There was marked infiltration of the lung with tuberculosis, and one could differentiate the ending of the tuberculosis and the beginning of the carcinoma on the particular part of the specimen of which some photomicrographs were made. This particular contribution appeared in *The Laryngoscope,* I think about seven or eight years ago.

DR. M. C. MYERSON: When this patient came to us, she had been tonsillectomized three months previously; she was operated on in another hospital, and so we did not see her pharynx before operation.

With regard to the remarks of Dr. Imperatori and the autopsy observations in four of his five cases showing that there was tuberculosis as a basis for the lung suppuration, I quote that in the substance of this paper and make mention of the fact that we should always think of tuberculosis in all suppurations of the upper lobe.

Bronchoscopy very likely may liberate pent-up tubercle bacilli in a patient who may have a mild tuberculosis which cannot be proved. Two years ago I reported a case in which the medical service suspected tuberculosis but it could not be proved. I performed a bronchoscopy which no doubt liberated some tubercle bacilli or peribronchial organisms, for shortly after bronchoscopy the sputum was laden with tubercle bacilli.

ABSCESS OF THE LUNG FOLLOWING TONSILLECTOMY. REPORT OF A CASE TREATED BRONCHOSCOPICALLY. DR. RICHMOND MCKINNEY.

This paper was published in full in the September, 1928, issue of the ARCHIVES, p. 326.

DISCUSSION

DR. THOMAS E. CARMODY, Denver: I think one point that was brought out by Dr. McKinney is important and that is early bronchoscopy. Another thing that he lays apparently to the general men and to the internists is the fact that they discover many of these before we do, and many of them are getting very keen about it.

There has been no discussion on massive collapse of the lung, which in many cases precedes our so-called postoperative pneumonias and abscesses of the lung.

Only recently I saw a case of massive collapse; the patient had been operated on Thursday, and at about Sunday noon the internist who was in charge of the case saw the patient and turned him on the opposite side in order to relieve the tension on the affected side. The surgeon coming in at 6 p. m. called me, and I immediately bronchoscoped this man in bed, removing three or four good sized mucous plugs. The temperature was 102.2 F., I believe, at the time, and fifteen minutes later it was 100. We also made an x-ray picture fifteen minutes later which showed a great amount of air entering the lung. This procedure was repeated one hour and twelve hours later, respectively. I believe in cases of this kind we avoid abscess of the lung by this procedure. This was a case of gastro-enterostomy and not a case of tonsillectomy. I think in may of those cases we have more trouble from abscesses of the lung because of the splinting of the muscles of the diaphragm, which limits the motion of the lung, and allows mucus to form in the bronchus. If we could only use the bronchoscope in some of these cases of abscesses of the lung early, we would find what Lynah found, and Myerson later, namely, that blood has been aspirated from the lung, and we would also save the patient.

In irrigating an acute abscess I think there is a possibility that Dr. McKinney spread the infection. Of course, it is easy enough to criticize him after it is done, but my experience of late years, after a fatal outcome in one patient, is that I do not irrigate these abscesses but I aspirate them. He said that he was unable to aspirate this because of the thick pus, but possibly with a larger aspirator he might have been able to.

I thank Dr. McKinney and the rest of you.

DR. M. C. MYERSON: There is one principle in the treatment of all localized suppuration that has apparently been overlooked, I would venture to say, in this case. When a patient has an acute suppuration of the lung, it should be determined whether the suppuration is localizing itself or whether it is going on to a diffuse lesion.

It seems to me that this never was a localized lesion but that this was a rather fulminating process; it was probably a gangrene of the lung; and no matter what was done, I doubt whether this patient would have had any different termination. I would like to say that, as bronchoscopists, we must be careful, particularly in

addressing general medical meetings, in our attitude in the individual case, not to give the impression that bronchoscopy will cure every suppuration of the lung. If we assume the attitude that bronchoscopy would have or might have cured this patient, we might lay ourselves open to criticism. Therefore, one must bear in mind the local process that is going on in all these cases before one can determine what is the best thing to do.

We also know that it is generally considered that in the presence of an acute pulmonary suppuration surgical measures are not accepted.

DR. RICHMOND MCKINNEY: In reply to Dr. Carmody's criticism, I desire to say that in view of the fact that the condition in this case was of five months' duration, I would regard it as a chronic condition. The condition had been present for five months before I saw the patient.

As to irrigation, I used warm saline solution to dissolve the pus; this was done in an effort to remove it and not as a curative agent. I tried several different aspirators, but the pus would not come through them sufficiently for me to clear out the cavity.

We had a number of pictures made, and it always seemed that they did not show evidence of extension from the cavity until the acute exacerbation and pleurisy developed. The parents asked me to use the bronchoscope and to do what I could. I told them that the child was going to die anyway, which proved to be the case.

SOME ENDOSCOPIC OBSERVATIONS IN CHILDREN. DR. EDWIN MCGINNIS.

Diagnosis of laryngeal and bronchial dyspnea by means of direct vision is becoming recognized as a valuable adjunct by the internist as evidenced by the following case reports.

The first patient was an infant 6 months old with a peculiar crowing cry and some dyspnea. Direct laryngoscopy revealed an abductor paralyis of the left vocal cord, probably due to injury at birth, as the mother had an instrumental delivery.

The second patient was a boy, aged 7 years, who had been ill for three days with an elevation of temperature and increasing dyspnea, with a diagnosis of probable foreign body. Bronchoscopy revealed a bilateral abductor paralysis but no foreign body or secretion in the air passages. Low tracheotomy relieved the dyspnea for ten hours, but the boy went into coma and died. Postmortem examination was not obtained. I diagnosed the condition in this case as influenza producing neuritis of the recurrent laryngeal nerves.

The third patient, a boy, aged 8 years, had scarlet fever in January, 1928, from which he made a good recovery. Six weeks later he suddenly developed croup during the night and was treated for laryngeal diphtheria. Intubation relieved the dyspnea. Twelve hours after removal of the intubation tube, the child had another attack of extreme dyspnea. Bronchoscopy revealed a bilateral abductor paralysis of the vocal cords but no obstruction in the trachea or bronchi. Low tracheotomy relieved the child for eighteen hours, when he developed pneumonia and died. Postmortem examination was refused. The question is, was this a toxic bilateral abductor paralysis?

The fourth patient, an infant, one of twins, 7 months old, developed noisy respiration, hoarseness and choking attacks. The child was treated for enlarged thymus without relief. Direct laryngoscopy revealed a left abductor paralysis with etiology uncertain, as delivery was normal.

DISCUSSION

DR. CHARLES J. IMPERATORI: Relative to the examination of some of these children that have been seen by pediatricians and treated for an indefinite time as cases of enlarged thymus, I saw a child that had been treated for a year, who had never cried and who had considerable difficulty in breathing. It was rather underweight and the last roentgenogram showed what appeared to be a still

persistently enlarged thymus. On laryngoscopic examination this child had a web across the larynx so that the laryngeal opening was about one third the normal size. This web was excised, the child has gained weight and apparently is all right. The shadow, of course, still remained as an enlarged thymus, and it is considered to be an enlarged thymus.

In another child with stridulous respiration whose roentgenogram showed an enlarged thymus, the laryngoscopic examination showed an exceedingly enlarged epiglottis of the funnel type. Following the examination either the stretching by the laryngoscopy or the trauma, caused the child to cease this stridulous breathing, and four months from the time of the original laryngoscopy it still remains in good condition and is gaining in weight. This child is less than 1 year old.

DR. RICHMOND MCKINNEY: A few weeks ago I saw a child, aged 9 months, that was sent to me with a history of having developed dyspnea and nearly suffocated. Again an emergency tracheotomy was done. The patient was sent to me later with a diagnosis of enlarged thymus. Several x-ray pictures had been taken and enlarged thymus was found. I did a laryngoscopy and found an abductor paralysis of the left cord. I then had an x-ray picture made of the chest and while there was no evidence of thymus, there was a large heart. I thought perhaps it was a congenitally large heart and that probably was the source of the pressure. It is something to bear in mind.

DR. LYMAN RICHARDS: Last year in Detroit I reported a few rather discouraging results of treatment of acute laryngeal obstruction in children. I have been impressed today, in hearing both Dr. Berry and Dr. McGinnis, with the relatively high mortality again following tracheotomy in cases of laryngeal obstruction in children, and it seems to me that we are confronted with a difficult problem in the handling of these cases.

This condition, with us at least in Boston, recurs particularly in each successive winter. Tracheotomy relieves temporarily the laryngeal obstruction, but except in rare conditions the pathologic condition extends down into the bronchi with crust formation and in most instances the removal of these crusts is followed by a septic pneumonia.

In Detroit I raised the question of whether it might be possible that secondary infection crept in through an anatomic wound in the case of tracheotomy and also whether at laryngoscopy an intubation tube might not be inserted at the same time, thus avoiding a tracheotomy.

DR. LOUIS H. CLERF: In this type of case there is present not only an infection of the larynx with a concomitant subglottic swelling but also a tracheobronchitis. Tracheotomy relieves the obstructive laryngeal dyspnea and also is a distinct aid in getting rid of secretions. Thick, tenacious secretion and crusting are always serious. Dr. Gittins has reported excellent results with a dilute solution of epinephrine. Dr. Eeman, while working with us at the clinic obtained satisfactory results with the use of salt solution. A small quantity was dropped into the trachea through the cannula and after a few seconds was removed with the aid of the mechanical aspirator.

DR. THOMAS E. CARMODY: The inhalation of steam in all these cases will help. In two or three cases I have used the epinephrine and it seems to relieve a great deal.

I had a case some years ago in which the patient before coming under my observation was treated as in the cases reported by Dr. McGinnis. The child had been treated for croup for three months, but on roentgenographic examination nothing showed. On examining with the direct speculum we found part of a cellular duct anteroposteriorly, between the cords. That, of course, was enough to explain it.

In cases of crusts I think that their removal with the bronchoscope, as Dr. Berry did in his case and as Dr. McGinnis has spoken of, will help a great deal. I have not tried the salt solution but I think that might be satisfactory. Epinephrine has given good results. If we will keep the air well saturated with steam, I think that it will relieve a great many of these cases.

DR. PORTER P. VINSON: We have had such excellent results in treating children with laryngeal edema by admitting them to the oxygen chamber or putting them in an oxygen tent that I wonder whether this procedure would not be helpful in treating the patients in this group of cases described by Dr. McGinnis.

DR. EDWIN MCGINNIS: I have been trying for a long time to get the pediatricians in our hospital and also the medical men interested in having us look directly at the larynx, the trachea, the tracheobronchial tree, and in the esophageal cases at the esophageal obstruction directly, and it is as a result of some of this work that I had a chance to observe these four cases.

We always use the tent. When Dr. Ingalls was still alive and doing bronchoscopic work, we had a regular croup tent fitted over the bed. We used steam inhalations and also oxygen inhalations, and in a good many cases the patients have been carried over a critical period, and I think a good many lives have been saved in that way.

In regard to the intubation versus tracheotomy, I have tried both ways. I have usually used the direct vision intubation according to Mosher and could see whether there was any secretion or fibrin which might fill up the intubation tube. I have usually intubated to accomplish a freer breath way. I have found in these acute cases of laryngeal inflammation that intubation added insult to injury in that it made pressure on sensitively inflamed mucous membrane and when I extubated, the laryngeal obstruction was worse than before the intubation.

I was interested in these cases of apparent abductor paralyses in that about two or three years ago I had a patient referred to me with a laryngeal tuberculosis, in which there was almost complete obstruction to breathing. There was not anything we could do for her except tracheotomy. This was done and given a general examination of the chest it was believed that the patient would not live long, because she had laryngeal tuberculosis and a bad generalized tuberculosis of the lung. To our surprise, about a week after our tracheotomy the lungs emptied out (I forgot to say that she was about six months along in pregnancy) and cleared. We sent her out to the Chicago Municipal Tuberculosis Sanitarium and she is out there today. She gave birth to a perfectly normal, healthy child that has not shown any evidences of tuberculosis at the present time, but the patient is still wearing the tracheotomy tube. I had not seen her for about eight or nine months after the tracheotomy when I was asked to go out to see her because I was advised that she could not get along with a cork placed in the tracheotomy tube. On examination, I found that she had a bilateral abductor paralysis; that is, the condition was the same as in a bilateral abductor paralysis. I am not clear as to whether the healing of the larynx produced a fixation of the cords in the midline position or whether the scar retraction around the tracheotomy wound with the tracheotomy tube in place produced a contraction and tension, catching the recurrent laryngeal nerves in the scar.

DR. SIDNEY YANKAUER: The next business of the society will devolve on Dr. Chamberlin and Dr. Carmody who will escort the new president to the chair.

Dr. Imperatori was escorted to the chair.

DR. C. J. IMPERATORI: I appreciate highly this honor that you have so graciously bestowed on me, and I hope next year when I turn the gavel over to my successor that you will find that your confidence has been well placed.

If there is no further business to come before the society, I now declare the eleventh annual meeting of the American Bronchoscopic Society closed.

The meeting adjourned at 4:25 p. m.

Directory of Otolaryngologic and Ophthalmologic Societies *

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

Chairman: Dr. William V. Mullin, Cleveland Clinic, Cleveland.
Secretary: Dr. Gabriel Tucker, Bronchoscopic Clinic, University Hospital, Phiiadelphia.
Place: Portland, Ore. Time: July 10-12, 1929.

AMERICAN BRONCHOSCOPIC SOCIETY

President: Dr. C. J. Imperatori, 17 E. 38th St., New York.
Secretary-Treasurer: Dr. Louis H. Clerf, 128 S. 10th St., Philadelphia.
Place: San Francisco. Time: July 6, 1929.

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Dr. Charles W. Richardson, 1337 Connecticut Ave. N. W., Washington, D. C.
Secretary: Dr. George M. Coates, 1721 Pine St., Philadelphia.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. Hill Hastings, 1136 W. 6th St., Los Angeles.
Secretary: Dr. R. L. Loughran, 33 E. 63d St., New York.
Place: San Francisco. Time: July 4-6, 1929.

AMERICAN OTOLOGICAL SOCIETY

President: Dr. J. Gordon Wilson, 104 S. Michigan Ave., Chicago.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
President-Elect: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.
Place: Atlantic City, N. J. Time: Oct. 21-25, 1929.

LOCAL

LOS ANGELES COUNTY MEDICAL SOCIETY, SECTION OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. Harold S. Muckleston, 6422 Hollywood Blvd., Los Angeles.
Secretary-Treasurer: Dr. J. Frank Friesen, 1208 Roosevelt Bldg., Los Angeles.

THE COLORADO OTO-LARYNGOLOGICAL SOCIETY

President: Major Royal Reynolds, Fitzsimons General Hospital, Aurora.
Secretary: Dr. Rex L. Murphy, Metropolitan Bldg., Denver.
Place: Assembly Room of Metropolitan Bldg. Time: First Saturday of each month from October to May.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

Medical Society of the District of Columbia, Section on Ophthalmology and Oto-Laryngology

Chairman: Dr. Walter A. Wells, 1606, 20th St. N. W., Washington.
Secretary: Dr. J. N. Greear, Jr., 1740 M St. N. W., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

Atlanta Academy of Ophthalmology and Otolaryngology

President: Dr. H. F. McDuffie, 45 Edgewood Ave., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

Chicago Laryngological and Otological Society

President: Dr. Edwin McGinnis, 104 S. Michigan Ave., Chicago.
Secretary-Treasurer: Dr. Austin A. Hayden, 25 E. Washington St., Chicago.
Place: Grill Room, Stevens Restaurant, 16 N. Wabash Ave. Time: 6 p. m., first Monday of each month from October to May.

Indianapolis Ophthalmological and Oto-Laryngological Society

President: Dr. Lafayette Page, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

New Orleans Ophthalmological and Otological Society

President: Dr. M. Earle Brown, Maison Blanche Bldg., New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans. Time: 8 p. m., third Thursday of each month from September to June.

Baltimore City Medical Society, Section on Otology and Laryngology

Chairman: Dr. Waitman F. Zinn, Medical Arts Bldg., Baltimore.
Secretary: Dr. Moses L. Breitstein, 1212 Eutaw Pl., Baltimore.
Place: 1211 Cathedral St. Time: 8:30 p. m., last Friday of each month.

New England Otological and Laryngological Society

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
Secretary-Treasurer: Dr. Charles T. Porter, 520 Commonwealth Ave., Boston.

Detroit Oto-Laryngological Society

President: Dr. William Fowler, 1048 Maccabees Bldg., Detroit.
Secretary-Treasurer: Dr. Don A. Cohoe, 13535 Woodward Ave., Detroit.
Place: Maccabees Bldg. Time: Third Wednesday evening of each month from October to May.

Kansas City Society of Ophthalmology and Otolaryngology

President: Dr. L. R. Forgrave, Logan Bldg., St. Joseph, Mo.
Secretary: Dr. A. E. Eubank, Argyle Bldg., Kansas City, Mo.
Time: Third Thursday of each month from September to May. The November, January and March meetings are devoted to clinical work.

St. Louis Ear, Nose and Throat Club

Acting President—Senior member of Executive Committee: Dr. E. T. Senseney, Lister Bldg., St. Louis.
Secretary: Dr. V. V. Wood, Humboldt Bldg., St. Louis.
Place: University Club Bldg. Time: Third Wednesday in February, April, October and December.

Omaha and Council Bluffs Ophthalmological and Otolaryngological Society

President: Dr. Charles M. Swab, Aquila Court Bldg., Omaha.
Secretary-Treasurer: Dr. J. C. Davis, 1615 Howard St., Omaha.

Academy of Medicine of Northern New Jersey, Section on Eye, Ear, Nose and Throat

Chairman: Dr. Lee W. Hughes, 1019 Broad St., Newark.
Secretary: Dr. Earle LeRoy Wood, 31 Lincoln Park, Newark.
Place: 91 Lincoln Park South. Time: 8:45 p. m., second Monday of each month.

New York Academy of Medicine, Section of Laryngology and Rhinology

Chairman: Dr. David H. Jones, 114 E. 54th St., New York.
Secretary: Dr. Edward Frankel, Jr., 152 W. 58th St., New York.
Place: 103d St. and 5th Ave. Time: 8:30 p. m., fourth Wednesday of each month from October to May.

New York Academy of Medicine, Section of Otology

Chairman: Dr. Clarence H. Smith, 2 E. 54th St., New York.
Secretary: Dr. James Garfield Dwyer, 57 W. 57th St., New York.
Place: 103d St. and 5th Ave. Time: Second Friday of each month from October to May.

Eastern New York Eye, Ear, Nose and Throat Association

President: Dr. M. S. Lord, 148 Barrett St., Schenectady.
Secretary-Treasurer: Dr. Arthur F. Holding, 142 Washington Ave., Albany.

Rochester Eye, Ear, Nose and Throat Society

Chairman: Dr. Frank Barber, 75 S. Fitzhugh St., Rochester, N. Y.
Secretary-Treasurer: Dr. Cecil B. Hert, 29 N. Goodman St., Rochester, N. Y.
Place: Rochester Medical Association, 13 Prince St. Time: 8 p. m., third Monday of each month from October to May.

Cincinnati Oto-Laryngological Society

President: Dr. C. C. Jones, Doctors Bldg., Cincinnati.
President-Elect: Dr. Harris H. Vail, 24 E. 8th St., Cincinnati.
Secretary-Treasurer: Dr. M. F. McCarthy, 2600 Union Central Bldg., Cincinnati.
Place: University Club. Time: 6:45 p. m., second Tuesday of each month from October to May.

Cleveland Academy of Medicine, Section of Ophthalmology and Otolaryngology

Chairman: Dr. Myron Metzenbaum, Rose Bldg., Cleveland.
Secretary: Dr. A. D. Ruedemans, Euclid and E. 93d St., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

Pacific Coast Oto-Ophthalmological Society

President: Dr. Robert R. Hampton, Boston Bldg., Salt Lake City.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Salt Lake City. Time: July 1-3, 1929.

Philadelphia Laryngological Society

President: Dr. Henry A. Laessle, 13th and Spruce Sts., Philadelphia.
Secretary: Dr. Herman B. Cohen, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., first Tuesday of each month from October to June.

College of Physicians of Philadelphia, Section on Otology and Laryngology

Chairman: Dr. George M. Coates, 1721 Pine St., Philadelphia.
Clerk: Dr. Frederick M. Strouse, 13th and Spruce Sts., Philadelphia.
Place: College of Physicians. Time: 8:30 p. m., third Wednesday of each month from October to June.

Southern Medical Association, Section on Eye, Ear, Nose and Throat

Chairman: Dr. William Thornwall Davis, 927 Farragut Sq., Washington, D. C.
Secretary: Dr. Fletcher D. Woodward, Box 162, University, Va.

The Memphis Society of Ophthalmology and Oto-Laryngology

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

Nashville Academy of Ophthalmology and Otolaryngology

Chairman: Dr. Herschel Ezell, Doctor's Bldg., Nashville.
Secretary-Treasurer: Dr. W. W. Wilkerson, Jr., Bennie-Dillon Bldg., Nashville.
Place: St. Thomas Hospital. Time: 8 p. m., third Monday of each month.

Dallas Academy of Ophthalmology and Otolaryngology

President: Dr. John G. McLaurin, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. M. Sellers, Medical Arts Bldg., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

Fort Worth Eye, Ear, Nose and Throat Society

President: Dr. C. P. Schenck, Medical Arts Bldg., Fort Worth, Texas.
Secretary-Treasurer: Dr. R. H. Needham, Fort Worth National Bank Bldg., Fort Worth, Texas.
Place: University Club. Time: 6:30 p. m., first Friday of each month except July and August.

Houston Academy of Medicine, Eye, Ear, Nose and Throat Section

President: Dr. John H. Foster, 1300 Walker Ave., Houston, Texas.
Secretary: Dr. Edward W. Griffey, Houston Clinic, Houston, Texas.
Place: Medical Arts Bldg., Harris County Medical Society Rooms. Time: 8 p. m., first Thursday of each month from September to June.

San Antonio Ophthalmolo-Oto-Laryngological Society

President: Dr. F. H. Roseborough, 302 Moore Bldg., San Antonio, Texas.
Secretary-Treasurer: Dr. William D. Gill, 323 Medical Arts Bldg., San Antonio, Texas.
Place: Bexar County Medical Library, San Antonio. Time: 8 p. m., first Tuesday of each month from October to May.

Virginia Society of Otolaryngology and Ophthalmology

President: Dr. H. B. Stone, Roanoke, Va.
Secretary-Treasurer: Dr. Fletcher D. Woodward, Box 162, University, Va.

PUGET SOUND ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Will Otto Bell, Medical-Dental Bldg., Seattle.
Secretary-Treasurer: Dr. Francis A. Brugman, Medical-Dental Bldg., Seattle.
Time: 8 p. m., third Tuesday of each month, except July and August.

SPOKANE ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

President: Dr. O. M. Rott, Paulsen Bldg., Spokane, Wash.
Secretary: Dr. C. A. Veasey, Jr., Spokane, Wash.

THE MILWAUKEE OTO-OPHTHALMIC SOCIETY

President: Dr. L. P. Allen, 145½ Main St., Oshkosh, Wis.
Secretary-Treasurer: Dr. Edward R. Ryan, 425 E. Water St., Milwaukee.
Pleace: University Club. Time: 6:30 p. m., third Tuesday of each month.

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